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The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

Protective Inoculations against Swine Fever in Hungary

by

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Since the year 1896 when swine plague made its first appearance in Hungary, it has caused enormous losses every year amongst the herds of swine. During the first year it spread rapidly over almost the whole country and in the following year 639 765 deaths were officially reported. After that the losses decreased, but only because the stock of pigs had considerably diminished. The usual veterinary police measures proved quite effectual in checking the progress of the disease and many large estates were constrained either to reduce their herds or to suppress them altogether. This very unsatisfactory state of affairs began to improve when protective inoculations were recognized as a suitable remedial measure.

Following on the results of DORSET, Mc BRIDE and NILES, which showed that the American *Hog Cholera* was caused by a virus, similar experiments were carried out in Hungary and proved entirely confirmatory, as were those of workers in other countries, proving that the European swine fever was caused by the same virus and is identical with American hog cholera.

This led to inoculation experiments being undertaken, on the same plan as those of the American investigators, by the writer and Dr. J. KÖVES; these likewise showed that pigs which have survived an artificial or natural infection can acquire a high degree of immunity and that their serum then has the property of protecting other pigs against artificial or natural infection. The experiments were repeated on a large scale in 1908; as they yielded satisfactory results, the necessary arrangements were made for producing large quantities of the protective serum. A somewhat primitive State laboratory was equipped at the stock farm at Kőbánya and was ready to distribute the serum in the spring of 1909.

The very first inoculations were successful and consequently the demand for the serum increased to such a degree, that the laboratory was scarcely able to meet it and it was found advisable to hand over the production of serum to a private company formed for the purpose, reserving the actual technical work concerned in the preparation to State officials, and submitting the company to State supervision. The laboratory was not moved, but considerably enlarged by new buildings and enclosures, the stock of pigs kept ranging between two and three thousand.

Hyperimmunisation is carried out as follows: pigs weighing about 2 lbs. and having already recovered from a slight infection, are subjected three or four times at intervals of about two weeks to subcutaneous injection on the belly. The infection consists of 300 to 400 cc. of virulent blood taken from pigs suffering from acute infection. About ten days after the last injection, blood is first drawn from their tails and finally they are bled to death by a wound in the heart. The blood obtained is immediately centrifuged and 0.5 per cent. of carbolic glycerin is added to the separated serum.

The following quantities of serum have been prepared since the foundation of the laboratory:

1909	622 839 cc.	} used entirely in Hungary.
1910	1 947 095 "	
1911	3 736 710 "	} the greater proportion used in Hungary.
1912	7 454 150 "	

Only serum that has been tested on animals and found effective is sent out. Table I shows the results of these tests on 104 six-months-Mangalicza pigs averaging 64 lbs. in weight.

TABLE I. — *Tests of swine fever serum.*

Quantity of virus — cc.	Immunising serum			Number of animals	Deaths from swine fever.	
	Quantity injected — cc.	Exp. Number (1)	Date when prepared		Absolute number	Per cent.
<i>Control animals</i>						
—	—	—	—	8	8	100
2.0	—	—	—	8	8	100
Total . . .				16	16	100
<i>Immunised animals</i>						
2.0	12.0	3/913	21. I. — 27. II. 1913	8	1	12.5
2.0	12.0	11/913	10. VI. — 21. VII. 1913	8	—	—
2.0	12.0	12/913	18. VI. — 16. VII. 1913	8	—	—
2.0	12.0	13/913	20. VI. — 31. VII. 1913	8	1	12.5
2.0	12.0	14/913	30. VI. — 9. VIII. 1913	8	—	—
2.0	12.0	15/913	10. VII. — 18. VIII. 1913	8	—	—
2.0	12.0	16/913	15. VII. — 1. IX. 1913	8	—	—
2.0	12.0	17/913	2. VIII. — 11. IX. 1913	8	—	—
2.0	12.0	18/913	22. VIII. — 13. X. 1913	8	—	—
2.0	12.0	19/913	12. IX. — 8. X. 1913	8	—	—
2.0	12.0	20/913	19. IX. — 14. X. 1913	8	1	12.5
Total . . .				88	3	3.4

(1) Every Exp. Number refers to 44-88 gallons of mixed serum. The animals were kept in infected sties throughout the experiment.

Inoculation with serum produces only a temporary or *passive* immunity, it has been found both in Hungarian and other experiments, that if the herds which have been treated with the serum are exposed at the same time shortly after to natural infection, they contract the disease in a mild form and acquire a permanent or *active* immunity. Consequently serum inoculation is only advisable in the case of already infected herds of swine, and should be practised as early as possible after the outbreak of the disease in healthy pigs and on those that are not yet severely affected, after which the herd may be left till the total disappearance of the disease in the locality. An early diagnosis of the first cases and timely inoculation are essential in order to obtain favourable results from the serum. Unfortunately in practice, errors in diagnosis are not rare and inoculation is often delayed until the plague has already caused heavy losses and the herds are already badly infected, in which case secondary bacterial infections often set in against which the serum is powerless.

In the course of five years upwards of a million pigs have been inoculated with the serum in Hungary. Accurate reports from veterinary surgeons of the results obtained from the inoculations practised on 110 198 pigs in 36 herds up to March 1, 1914, have been received, and are summarized in Table II.

TABLE II. — *Results of serum inoculations in Hungary from April 1909 to March 1914.*

Inoculated herds		Inoculated animals		Limits of losses in inoculated herds	Total loss	
Number	Per cent	Number	Per cent		Number	per cent
408	48.8	35 738	32.4	0	—	—
156	18.7	32 734	29.7	0.1 — 5.0	667	2.0
75	9.0	12 176	11.1	5.1 — 10.0	886	7.3
81	9.7	14 096	12.8	10.1 — 20.0	2 236	15.8
720	86.2	94 744	86.0		3 789	4.0
37	4.4	5 410	4.9	20.1 — 30.0	1 270	23.4
46	5.5	5 699	5.2	30.1 — 40.0	2 140	37.5
33	3.9	4 345	3.9	40.1 and above	2 905	66.4
836		110 198			10 104	9.4

A reappearance of swine fever in herds that had been freed from it by inoculation was only rarely reported, and in these cases it is suspected that the other disease, such as swine erysipelas, was present. The permanent immunity of the animals treated with serum was also proved by thousands

of observations made on pigs, which, when hyperimmunised, were found to resist large quantities of virulent blood without any ill effect upon the health.

The experience gained in large fattening establishments is also instructive. In these cases the herds were inoculated immediately after the first appearance of the disease and suffered no appreciable loss, while formerly the havoc was almost always considerable. According to a report by Csiki in one fattening establishment at Kőbánya, 19 herds with 2478 pigs were inoculated in the course of two years, after which 185 head, or 7.5 per cent., had to be killed owing to severe illness. In the second year the losses diminished considerably and in three herds none were reported. On the other hand out of 150 pigs which were left as controls and not inoculated 62, that is 41.3 per cent., fell victims to the disease. In 5 herds which were inoculated after some delay the losses ranged between 20 and 35 per cent. (altogether 144 head, or 27.5 per cent.). In eight other herds in the same locality, whose owners would not allow their animals to be inoculated, 8 pigs out of 1404, that is 53.8 per cent., had to be killed, the losses in the various herds ranging from 29 to 86 per cent.

As a result of this experience pigs, intended for fattening are generally treated with the serum shortly after being put into the fattening sties and losses are thus avoided. Such is the confidence in the protective action of the serum that store pigs are now bought with impunity from ordinary herds, while formerly only such pigs were admitted to the fattening pens as came from herds having recovered from a slight attack of swine fever and which on that account could be considered as immune. Differences in the value and market price of the pigs according to their degree of natural immunity have consequently disappeared.

The permanence of the results of inoculation helped to spread the practice throughout the whole country, with the result that the swine industry has successfully recovered from a period of great depression and the number of pigs in the country has considerably increased.

The practical difficulty of obtaining an early diagnosis of swine fever followed by immediate serum inoculation of the herd, led to experiments being made several years ago on the so-called *immediate active immunisation* of healthy herds, a method which is preferred to serum inoculation in North America. It consists in the simultaneous subcutaneous injection of serum and virulent blood and it also presents some drawbacks, namely: 1) that the proportion of virus to serum to be used cannot be determined previously with exactitude, and consequently one can never be perfectly sure that the inoculation will not cause serious losses, and 2) that in this way previously healthy herds get the plague and may prove new centres of infection. On the other hand the simultaneous injections have the great advantage that they can be employed at any time and that only healthy herds are subjected to them, so that errors of diagnosis are out of the question.

A large number of practical experiments were undertaken in order to judge of the value of this method in Hungary. Herds of Mangalica store pigs bought in different localities were placed on two large farms

kept for several months in the open but separate from one another. The inoculations, which were always made by veterinary surgeons belonging to the laboratory, consisted in the subcutaneous injection of 1 to 2 cc. of virulent blood and 10 to 20 cc. of the serum. In almost all cases, after about a week well-marked reactions were observed: a certain number of inoculated animals appeared less lively and ate their rations more slowly than at all. These symptoms, however, usually only lasted a day, after which the animals got well again, with the exception of a few which grew worse and eventually died.

On one of the estates, between September 1910 and May 1911 ten herds comprising 3163 pigs between the ages of 8 and 14 months and weighing to 120 lbs. per head were inoculated. After an incubation period of 10 days, 467 head, or 14.7 per cent., fell ill and 73 head, or 2.3 per cent., died. With the exception of one herd, in which 6.2 per cent. of the inoculated animals died on account of a simultaneous outbreak of foot-and-mouth disease, the losses in the remaining herds kept below 3 per cent. After several months the pigs were fattened, and then in three herds 4.3, 2.0 and 1.6 per cent. of the pigs respectively contracted swine fever and had to be killed; the remaining herds suffered no loss.

On the second estate, at different seasons between July 1910 and February 1914, 45 herds with a total of 15394 pigs aged from 2 to 24 months were inoculated simultaneously with virulent blood and serum. Here also more or less violent reactions were obtained after about a week, but in the great majority of cases these caused only insignificant losses, as may be seen from the following table (Table III).

TABLE III.

Number of		Deaths	
Herds	Pigs	Head	Per cent
.....	3 344	0	0
.....	9 894	176	1.7
.....	350	25	7.1
.....	290	21	7.2
.....	539	44	8.1
.....	351	52	14.8
.....	420	90	21.4

In the first year of this experiment new cases of disease and death appeared in 8 herds several months after the inoculation reaction (altogether 10 pigs out of 2802 animals, or 2.5 per cent.). As these cases were reported as swine fever it seemed as if they were the result of a retarded reaction, but further investigations proved them to be cases of swine erysipelas, where-

upon all such cases of subsequent disease were immediately treated with the sipelas serum; the result was that only 4 animals died in one herd of 476 pigs and none at all in the other 44 herds. Out of the 45 herds that were inoculated, 37 were put up to fatten partly in the same locality and part at Kőbánya and in no case were there any losses from swine fever. The permanence of immunity was also tested by the fact that in 7 herds, seven weeks or months after the reaction, 245 pigs were infected artificially by subcutaneous injections of from 3 to 5 cc. of virulent blood, with the result that only one pig died and the others showed no signs of a reaction. Besides this, several herds were used later for the production of serum and with this object were treated with large quantities of virulent blood without suffering any loss.

The results obtained in Hungary during the last five years are in perfect accord with those obtained in North America, and show that swine plague can be successfully checked both by pure serum inoculations and by simultaneous injections. Serum inoculation is advisable for the treatment of recently infected herds and results in a rapid disappearance of the plague provided the first cases are diagnosed soon after the outbreak and the rest of the herd be inoculated immediately: in this case, owing to the simultaneous natural infection, they acquire a permanent active immunity. By the simultaneous inoculation with virulent blood and immunising serum the pigs get a direct active immunity. In quite healthy herds simultaneous inoculations usually causes no losses at all or only quite insignificant ones, though there is no certainty that very violent reactions may not occur. Considering that animals thus inoculated secrete infectious virus during the period of reaction, precautions must be taken to prevent the possible spread of the disease to other herds.

The Cattle Industry in Italy at the Present Day

(Continued from p. 606)

by

R. ZAPPA,

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F. Tuscany.—The cattle in this region vary very much with the locality, but the most noteworthy breeds are the *Maremma*, the so-called *Mucca Pisana*, and especially the *Valdichiana*.

a) The *Maremma* is represented by the cattle found in the province of Grosseto and in a small part of the Pisa province; they are kept entirely or almost entirely on the pastures and present the characters of the *Podolian* type. They stand high with fore-quarters more developed than hind ones, their dewlap is abundant, their horns are thick and long, their coat is light or dark gray, darker on the fore than on the hind quarters and with black points. The cattle are semi-wild, hardly at

stant; they are consequently especially suitable as draught animals, of little or no value as producers of milk and meat.

b) The *Mucca Pisana* is met with here and there in Tuscany, but especially frequent in the provinces of Pisa and Florence. Its coat is $\frac{1}{2}$ or nearly so, and it is believed to be of Swiss origin. Some authorities are of opinion that other foreign breeds have also contributed to its nation. It is a fairly good milker and is also suitable for the production of meat and for draught purposes.

c) But among the Tuscan breeds the most prevalent and most important is the *Chianina* or *Valdichiana* breed, with its breeding centre in the Valley of the Chiana. Without entering into the question of its true origin, which has been much discussed and is not yet settled, there is no doubt that this breed manifests some morphological characters owing to the *Podolian* type. The animals stand high and have been called by LAYDER the giants of the species, the oxen measuring up to 6 ft. 4 in. Normal adult males in store condition weigh 1760 to 1980 lbs., cows 1320 to 1540 lbs.; at the Florence show of 1905 a fat ox weighed 2935 lbs., while cows can weigh up to 2200 lbs. These animals are unusually long-limbed; the coat is generally silvery grey, with a tendency to gray about the neck and shoulders in all the finest specimens, especially in bulls, and black points. The horns are rather short. The calves are born with a yellowish red coat which gradually turns white at between three and five months. Animals having pink spots on their tongues, muzzles, etc., or white hairs on the brush of their tails, are commonly called *mucchi* and discarded, these variations generally being hereditary and showing a tendency to inbreeding which is considered a sign of degeneration; *mucchi* are nevertheless markedly suitable for fattening. *Valdichiana* cattle are remarkable for their early maturity and fineness. They are both good draught animals and good meat producers, in fact with regard to this latter quality they compete with breeds bred specially for the purpose. They fatten rapidly and kill well, yielding as much as 70.9 per cent. in carcass tests and never less than 60 per cent. Their strength as draught animals has been slightly reduced through the excessive refinement of the breed, so that they are only used for haulage and agricultural work on the plains and on rather heavy soils. As for milk, the cows barely produce enough to rear their own calves. The breed has been famous for a considerable time and has been widely used and illustrated more than any other Italian breed. Of late years it has been the object of special attention on the part of distinguished breeders and enthusiastic breeders, amongst which Prof. EZIO MARCHI, at PASSERINI of Bettolle (Arezzo) and the Counts of FRASSINETO (Arezzo) deserve to be mentioned. It has spread beyond the limits of its district, not only in Tuscany itself but also in the Upper Tiber Valley, Umbria and elsewhere.

G. Marches and Umbria. — These two regions being situated between the Adriatic and Romagna on one side, and the Abruzzi and the Roman Campagna on the other, their cattle represent as it were an intermediate

stage between improved conditions of animal husbandry and its initial phases. Nevertheless, even here, marked progress may be recorded during the last few years. The inhabitants of the Marches classify their cattle into three groups which they consider as three distinct breeds.

a) The *mountain breed*, small and hardy animals, poor producers of milk and of meat, belonging to the *Podolian* type. On the high mountains pure *Maremma* cattle are frequently imported.

b) The so-called *plain* or *improved* cattle of the Marches, which is also called the *Perugia* breed, and which is the most important. It is the result of crossing the *Valdichiana* with the native cattle of the *Podolian* type, which was carried on during the second half of the last century. The *Valdichiana* characteristics which now predominate in this breed are somewhat too exacting for local agricultural conditions; but the latter are gradually being improved and the infusion of some *Romagna* blood is also tending to adapt the cattle to their surroundings.

c) An intermediate breed is found on the hills, especially in the provinces of Ancona and Ascoli Piceno. It is the so-called *brina* or *marina* breed, and is the result of crossing the mountain and plain cattle. Gray in colour, but lighter than the mountain breed, it is smaller and more compact than the improved breed, being also coarser, harder and very suitable for draught purposes.

In the country about Fermo and Pesaro a good many pure *Romagna* are bred and are daily becoming more popular in the Marches.

Umbria appears to have no distinct indigenous breed. The mountain are mostly stocked with *Maremma* cattle, and the plains and the valley with *Valdichiana* or *Perugia* cattle.

H. *Latium, and the Southern Adriatic and Mediterranean regions.*—In the south of the Marches and Umbria the prevailing cattle all belong to the *Podolian* type, which undergoes various local modifications. Occasionally imports of improved Italian or foreign breeds are met with, especially amongst dairy cattle near large towns, in which case the *Schwytz* are the most popular, though other breeds are also represented. The first imports of foreign cattle date back to early times. The Bourbons imported animals from Switzerland and from England, and traces of these are visible in the cattle of the neighbourhood of Naples and of the whole Sorrento peninsula. Of late years the imports have increased, not only to supply the dairies with milk but also to improve the native cattle. The best results have usually been obtained with the *Schwytz* breed on account of its remarkable adaptability.

The native *Podolian* or *Apulian* cattle are kept out on the pastures and receive no sort of attention unless environmental conditions make it imperative or unless the animals are required for draught purposes. They are allowed to breed promiscuously, or almost so, and this accounts for the lack of differentiated breeds, the local modifications which occur being due to natural external agencies.

The cattle of *Latium*, frequently called the *Agro Romano* breed, represent one of these modifications and are characterised by uniformity,

to the relatively uniform conditions under which they live. They are the average in stature, strongly built, with long thick horns and a dark gray coat.

The animals are very hardy, robust, almost wild and especially suited for draught purposes.

Throughout the whole region it may be said that the cattle found on the hills are harder, smaller, darker in colour, and produce less milk than the cattle of the plains and valleys.

J. Sicily. — Animal husbandry occupies a very secondary position in the agricultural economy of Sicily, which is one of the poorest regions of all Italy. The number of stock, moreover, shows little sign of increasing, owing to the scarcity of keep. Cattle are kept almost entirely in the open, and only rarely housed.

Experiments have been made to introduce foreign breeds, especially in the neighbourhood of the large cities, but with indifferent success. Crosses have been attempted with *Schweitz*, *Simmental*, *Valdichiana* and even *Dutch* and *Shorthorns*, but only the *Schweitz* have given good results. The native or *Sicilian* cattle are usually divided into three sub-breeds:

a) The *coastal*, *plain*, or *Modica* breed which occupies the district of Modica and the western slopes of Etna.

b) The *Mezzalina*, or *hill* cattle, in the province of Trapani and the north of Catania.

c) The *mountain* breed, found in the high mountains, as in the districts of Mistretta, Patti and Nicosia.

The *Modica* cattle are the most esteemed, and are most typical of the breed. They stand rather high (oxen up to 5 ft. 8 in.) and three-year-old cows weigh from 1320 to 1650 lbs. The coat is light or dark red — darker on the fore quarters and on the more exposed parts of the body — with black points; the horns are rather short, especially in the males, and black at the tips; the dewlap is somewhat large, especially in the males. The cows have well developed udders. They are good draught animals and milkers, but not very suitable for meat production.

The milk yield varies considerably with the individual and with the season. In a good season when there is plenty of feed on the pastures, cows will yield as much as $3\frac{1}{2}$ to $5\frac{1}{2}$ gallons of milk daily and more during the spring and autumn; some cows are said to have given as much as 660 gallons of milk at one lactation, but during the summer the secretion of milk ceases.

The *mountain* cattle are small and very hardy; their horns are very small and their coat is a much paler red; they are strong and resistant, but are not good for the production of either milk or meat.

The *Mezzalina* sub-breed occupies an intermediate position both for size and other characters.

K. Sardinia. — Agriculture in Sardinia is prevalently of an extensive type, based on the production of live stock and cereals. Livestock is of the greatest importance in Sardinia. Cattle especially are the chief source

of wealth and of recent years have both increased in numbers and proved in quality.

The old Sardinian is gradually disappearing, leaving in its place the improved breed which is becoming increasingly popular on the mainland. Only in the mountains and in out of the way places are those small animals still to be seen, which formerly were characteristic of the whole of Sardinia and which stand only about 4 ft. high and weigh under 550 lbs. Their coat is reddish or yellowish, with black muzzles, but switches to their tails and brown rings round the eyes; their horns long and thick, and their yield of milk and meat is very poor.

The present cattle is the result of repeated crosses with imported breeds. Bulls from Sicily, Piedmont, Lombardy, Tuscany and the Maremma were first imported for the purpose, but of late *Schweitz* bulls have been preferred, and every year they are now imported on a large scale. The cattle have much improved with regard to size, early maturity and milk and meat production; at the same time, they are good draught animals; their live weight ranges from 1320 to 1760 lbs. These results have been obtained in spite of the very primitive conditions under which the animals are still reared.

From the foregoing account of breeds and their distribution, it is apparent that the cattle industry in Italy has undergone considerable development in recent times, and is likely to increase in this direction with the spread of education and of the cooperative spirit. Nevertheless, much remains to be done and a higher degree of production will hardly be reached in many parts unless State aid be granted to start the process of improvement.

Recent Experience and Progress in Beekeeping in Germany

by

F. GERSTUNG,

Editor of "Deutsche Bienenzeitung in Theorie und Praxis", Osmannstedt in Thuringia

Beekeeping in Germany had made satisfactory progress both in the theory and practice, notwithstanding the unfavourable conditions of weather and of yield, which, during recent years, have diminished the returns of the industry.

The action of the State in establishing institutions for research and instruction, and the organisation of theoretical and practical courses of beekeeping, now held regularly every year in almost all the beekeepers' associations in the Empire, have largely contributed to the progress of beekeeping. Thus in Bavaria, which numbers about 50 000 beekeepers, a scientific institution for the study of bees has been founded at the University of Erlangen; here, elementary and advanced courses are held on beekeeping, diseases, the breeding of queens, etc., under the direction of Professor Ewer

NDER. This institution is under the general supervision of the Professor of apiculture, Dr. FLEISCHMANN.

The results of the scientific work of this institution have been published in the work of Professor Zander: *Handbuch der Bienenkunde in Einzelstellungen* (1). The yearly reports are published in the *Landwirtschaftliches Jahrbuch für Bayern* (2).

Every year scientific and practical courses for persons from all the conerated states are held at the Royal Horticultural Institution at Dahlem, Berlin. The scientific instruction is given by Dr. KÜSTENMACHER, professor of beekeeping in the institution, and other teachers (for chemistry, biology, etc.). The practical instruction is given by the writer of this paper or other leading men of German beekeeping. The reports upon the work of the Institute appear regularly in the *Bericht der Königl. Gärtnerlehranstalt Dahlem bei Berlin* (3) (Report of the Royal Horticultural Institution of Berlin near Berlin), made by the Director, Herr Oekonomierat TH. ECHLMAYER.

The director of the Biological Institute at Dahlem, Dr. MAASSEN, occupies himself especially with the diseases of bees. It is to a great extent due to him that the etiology of foulbrood has been satisfactorily and scientifically explained; on the basis of the results of his investigations a law has been drawn up on foulbrood and other contagious diseases of bees, which will probably be discussed and approved by the Reichstag in the course of this year.

The Imperial Sanitary Office (*Reichsgesundheitsamt*) has published a memorandum on the honey trade, in which it warns German beekeepers of the danger that threatens them in the shape of cheap foreign and artificial honey, and communicates the measures adopted by the authorities and decisions of the law courts for the protection of beekeepers and of the honey-consuming public. Dr. KUSTENMACHER published in the *Deutsche Bienenzeitung in Theorie und Praxis* (4) year 1910, a series of articles with the object of explaining scientifically "what is honey", upon which the Reichsgesundheitsamt published an *Entwurf zu Festsetzungen über Honig* (Draft definitions of honey), which contains the preliminaries and bases for a law on the protection of honey demanded for many years past by German beekeepers. In consequence of the improvements in the methods of examining honey, due to the labours of Professor HAENLE of Strasburg, FIEBIGER of Berlin, Prof. LANGER of Graz, and others, it has become easier to distinguish with certainty between pure and mixed or adulterated honeys and to prove the kind and degree of adulteration.

As for the special questions connected with the study of bees, which during recent years have awakened most interest, we can in this short review only mention the more important.

(1) Published by Eugen Ulmer, Stuttgart.

(2) Published by Carl Gerber, Munich.

(3) Published by Paul Parey, Berlin.

(4) Published by Fritz Pfenningstorff, Berlin.

The discussion as to the notion of the bee colony still continues. The anthropomorphic theory and the so-called organic theory oppose each other. The first considers the colony as a closed family (called also a State) of several individuals united for the purpose of conservation and reproduction, and who, in consequence of their special endowment and intelligence, are capable of adapting themselves suitably to the structure of their state and of finding out and fulfilling the special function which each has to perform. The other theory, that of the so-called organic point of view, which has been introduced and defended by us, considers the colony as a whole as a living unit, which, according to its wants for the conservation of the species, develops out of itself special organs in the form of different beings which form the colony. The various functions which are indispensable for the preservation of the whole are correspondingly distributed among its members according to their age and sex. The preservation of the colony is not based on the free choice of functions by each member, which presupposes a certain intelligence in the bees, but by the difference of the physiological structure of the individual members and of the whole colony, caused by the conditions of their life, from which arise the capacity for and necessity of the various forms of activity for the conservation of the whole, to the exclusion of the free choice of functions on the part of the individual. The organic point of view has found decisive scientific support from the recognition that certain organs develop and begin to function only at certain periods, and after having fulfilled their duties disappear again. It is known that the wax glands do not develop their full functional activity until about 8 days after the emergence of the young bees and then retrograde until they cease to act; further, that the young nurse develops to its full perfection a gland which is only found at this stage, but which is necessary for the digestion of pollen, and that this gland gets atrophied as soon as the bee has passed the stage of nurse bee and has become a worker. This shows clearly that the most important functions for the preservation of the colony and of all its members are connected with the various ages and with corresponding physiological states and anatomical transformations. The organic theory recognizes logically a rigorous division of work, which represents the real basis for all the measures adopted in the practice of beekeeping. It adapts its methods as much as possible to the biological laws of the colony and endeavours to practise systematic beekeeping. The organic theory of the bee colony and its consequences for the theory and practice of beekeeping are treated *in extenso* in the book *Der Bien und seine Zucht*, 4th Edition (Berlin, Fritz Pfennigstorff).

The question of *parthenogenesis*, which has been so much debated during the last sixty years is again the subject of lively discussion. The most minute investigation into the eggs of bees has proved that the original opinion of Dr. DZIERSON is still scientifically well founded; according to his theory the male members (drones) issue from unfecundated eggs, while the female members (queens and workers) hatch out from fecundated ones. Dr. NACHSHEIM of Munich has furnished scientific proof of this, while Prof. BRESSLAU of Strasburg has recognized and described the mechanism of fecundation.

Nevertheless, even these new discoveries fail to explain how the queen is capable of fecundating her eggs or not according to their destination.

On the origin of the bee pap which the young larvae get during the first few days of their development, no unanimity of opinion has been attained in spite of intense investigation. Professor ZANDER and others uphold SCHIEBENZ' views, according to which the nutriment proceeds from the glands of the head and thorax of the young nurse-bees. Dr. KÜSTENMACHER shares RUCKHART-SCHÖNFELD'S opinion, namely that the chyle stomach produces the bee pap. The latter considers the chyle stomach as the seat of the production of propolis.

It is satisfactory to note that of late years eminent zoological scientists have turned their attention to investigations on bees, and one may hope that before long many obscure points will be cleared up.

Practical beekeeping in Germany has, during the last ten years, undergone far-reaching changes. The most striking is the change from the fixed (basket) or skep hives to the movable bar frame hive and in the latter from the system of hives having the opening behind to that with the opening above. Quite recently horizontal hives have taken the place of vertical ones, and lastly, large hives are used instead of small ones.

The completely changed conditions of the honey-bearing flowers, which have converted the districts in which formerly the honey was gathered late to early yielding districts, have led to fixed hives falling more and more into disuse and being now almost limited to the heaths. In East Prussia, where formerly only basket hives (Kanitz hive) were common, the so-called mixed system prevails, that is the Kanitz basket hive is used as brood hive and for winter quarters, while a large lift with movable bar frames is placed on it for the honey. In this way it is possible to obtain centrifuged honey without destroying the combs. Nevertheless, the new bar frame hives are continually spreading in East Prussia.

In 1880, at the meeting at Cologne, uniform dimensions for the bar frame hives, which are still frequently called Dzierzon or Berlepsch hives, were fixed on, the so-called *German-Austrian standard* (8.79 in. wide by 7.29 in. high for half frames and 14.58 in. high for whole frames). It soon appeared that these dimensions were not favourable to the development of the colonies. The early collection of the honey demanded a numerous population already in May and June, to be able to utilize completely the season which was often very short. This was not, however, possible with the standard hive, except with much trouble and difficulty, by enlarging the brooding space and similar measures.

At the same time as the insufficiency of the standard measures was recognized, the discovery was made of the laws which govern the making of wax and of the brood cells, which was to prove of the greatest importance for the construction of hives (1). With the demand for more space for the development of the colony was added the one due to a better knowledge of

(1) See: *Grundgesetz der Brut- und Volksentwicklung des Biens*, sixth edition: Berlin, 1912, Plönningsdorf.

the nature of a colony, namely for *Space corresponding to the population*. Thus scientific dimensions were introduced into Germany, during the last twenty years and they have given satisfaction throughout the country. They are the following: 15.75 by 9.84 inches or 155 square inches for the comb without the wooden frame, and nine such combs afford the colony sufficient brooding space. These dimensions, wherever they have been applied with understanding, have given the best results, and it seems that their substitution for all the others will be only a question of time. It hardly is to be expected that these will ever be replaced by other dimensions as with them the habitation of the colony is made according to its requirements. The colony itself ought to change before other dimensions could be considered suitable.

This systematic brood comb has been adopted in many systems of hives which formerly used the standard dimensions, as for instance the Bielepsch, the four-storied Liedloff, the Alberti, the German-American and other hives. Most modern hives are built according to these dimensions.

On the introduction of this modern system the influence of America was felt. Almost all the American forms of hives prefer the isolated position of the colonies in the open under a separate protecting roof, which naturally suggested the idea of handling the colony from above. This method at first seemed strange and unusual to German beekeepers, who mostly kept their colonies in bee houses and handled them from the back of the hive. The handling from above and the new dimensions encountered many difficulties, and had to struggle with much prejudice, but with time all hostility has been overcome. When, during the last five years the horizontal hives became the fashion in Germany, the handling from above, which a short time previously was held to be impossible, began to be considered quite natural.

When the systematic dimensions were introduced the vertical hives were preferred, that is those with high frames. For countries without late honey these hives are even now the best form, as they oblige the colony to provide first of all the necessary store of food for the winter and to deposit it overhead, before bringing the beekeeper's share into the lifts. These hives, by their special build, prevent the pernicious practice of feeding with sugar and causing the degeneration of the bees.

Certain conditions of the honey crop (fir and heather honey, etc.) render it necessary to remove all the honey from the body box or to collect as comb-honey all that which cannot be removed by centrifugation. This is not easy with the vertical hive; consequently, by the side of the vertical hives, have been introduced the horizontal ones, in which the modern brood comb is simply laid on its side without altering its dimensions. It is advisable to build the horizontal hives with the frames at right angles to the side which bears the alighting board and entrance.

The horizontal hive induces the bees, without any effort on the part of the keeper, to deposit all the honey they collect in the lifts, whence it can be easily collected. This can cause the body box to be completely freed from

they when the booty is not heavy and sometimes in very poor years it even endanger the existence of the colony.

The more unfavourable the conditions of the supply of honey-bearing flowers, the greater must be the care bestowed on the bees in order to get satisfactory returns from them. We cannot enter more fully into the subject, which, besides, is treated in every modern work on beekeeping.

An unforeseen difficulty in the way of adapting beekeeping to the changed conditions in the supply of honey-bearing flowers arose by the introduction made some decades ago of foreign breeds of bees, which hybridized the native bees that were well adapted to their environment, and in most cases spoiled them. It became necessary to breed, by selection, bees suitable to present conditions. This was no easy task, as it is not possible to select a particular male (drone) for the mating. The impulse to scientific breeding of queens, from both the theoretical and practical points of view, came from America. VON STACHELHAUSEN worked out several sure methods and introduced them into Germany by his book: *Der Bienenstock und seine Zucht*. The Swiss also, under the leadership of Dr. KRAMER in Zürich, have devoted much care to the breeding of queens, which at present awakens much interest in Germany and is practised with success.

The recent investigations into the laws of heredity have yielded new principles and methods in the selection of breeding stock and of breeds, so that at present methods founded on scientific bases can be employed to obtain, by means of selection, the desired qualities.

In conclusion, the following are some statistics concerning bees and beekeeping. On December 1, 1912, the total number of beehives in the German Empire was 2 619 891, the highest on record. East Prussia, Württemberg and Baden have had the greatest increases. The importation of wax amounted to 2952 tons, worth £409 500, the exports to 1430 tons, worth £270 500. Duty was paid in 1912 on £129 360 worth of honey.

German beekeepers attempted in 1913 to unite all their associations in one in order to defend their interests vigorously, but they have not succeeded in the proposed unification.

SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

489 - **The Agricultural Conditions of Albania.** — SEDLMAYR, E. C. in *Wiener landwirtschaftliche Zeitung*, Year 64, No. 31-32, pp. 279-280. Vienna, April 22, 1914.

Leaving out of consideration the mountain pastures, whose area is difficult to estimate, the area of the land available for agriculture in Albania is between 500 000 and 600 000 acres. The most extensive estates are situated in the large plains along the sea, while the best soils are in the mountain valleys of the large rivers.

The greatest landowner is the State, and the large estates of which it disposes are partly absolute State property and partly « *mewkuf* » or « *vacuf* », i. e. ecclesiastical property. The large private estates are in the hands of about five great families, each of which possesses from 100 000 to 150 000 acres of land. Medium-sized estates of about 500 to 1000 acres in extent are fairly common all over the country, while peasants' farms of about 25 acres are rare in the plains, but prevalent in the mountains.

The large estates, both State-owned and private, and many of the medium-sized estates are worked on the share system. The size of the farm (« *tschiftlik* ») depends upon the number of members in the farmer's family and upon the quantity of live stock he possesses. One-tenth of the grain crop (« *dim* ») goes to the State; of the remaining nine-tenths, one-third goes to the landowner, and the rest or six-tenths to the farmer. In southern and central Albania large tracts of country lie fallow or are merely grazed owing to the scarcity of farmers; at present barely 20 per cent. of the whole cultivable area is being farmed.

Agriculture is still in its infancy, the only implements used for tillage the soil being a primitive wooden swing-plough and a harrow formed of a bundle of thorns. Only quite recently some of the very largest farms in the north have provided themselves with modern ploughs, hay bales

d a few other implements. Regular rotations are unknown. The most common crop is maize grown continuously, while small areas are put to wheat, rye, barley and oats. In some places tobacco, flax, hemp and cotton are to be seen, and to the south of Skumbi also rice fields. The agricultural produce is chiefly devoted to the needs of the local population, for means of transport are not only insufficient, but also unsafe.

Live stock is rather more important than the raising of crops, but is also conducted on extensive lines. Stabling is almost unknown, the animals being kept on the open pastures until they are ready for the market. The horned cattle are represented by the so-called Illyrian breed, small animals rarely attaining a height of 3 ft. 6 in., yellowish brown, yellow gray brown in colour and generally uniform; the buffaloes often met with in the plains are more strongly built, larger and better developed. The native horse is small, hardy and very thrifty and is very suitable as a saddle and pack horse. Asses and mules, especially in the south, are not rare. In the mountains, sheep prevail, especially in the form of a kind of wild sheep which supplies the peasants with meat, wool and skins, as well as milk. Goats are kept; throughout the country, but especially in the mountains, they are a fine, well-developed breed. Very fine poultry is also found in Albania, while in many localities bees are kept, but in a most primitive fashion.

Oil and wine making are important branches of agriculture, while amongst fruits quinces and pomegranates thrive very well, besides plums, apples and pears, and in the north walnuts are abundant.

The grazing lands are extensive tracts often covered with bracken or are almost desert like with scanty herbage growing among the stones. At other times they are arable land allowed to fall back into pasture. Meadows are rare and only attain any importance in the north. Grass leys are quite unknown.

Forestry has been still more neglected than agriculture and live stock, and extensive tracts of forest have been spoilt or completely destroyed by injudicious management. It is only in out-of-the-way valleys in the high mountains that valuable forests still exist.

In conclusion, the writer points out that agriculture may flourish and develop in Albania provided that the numerous rivers of the country are utilized systematically for irrigating the extensive plains and for the production of electric power, and that the means of communication are improved, the conditions of ownership settled, and the working classes educated.

— **Agriculture in the Argentine Republic.** — HERMES, A., with the assistance of HOLZMEIER-SCHOMBERG, H. — *Berichte über Landwirtschaft*, published by Reichsanstalt des Innern, pp. VIII + 311, 48 tables and 17 maps. Berlin, 1913.

The writer discusses in the introductory chapters the geographical position, area, history, the orographic, geological and soil conditions, as well as the hydrography and climate of the Argentine Republic. He reviews also the conditions of its native population and immigrants, and of the means of communication, and then proceeds to a description of the agri-

cultural conditions of the country, from which the following data are extracted.

Agriculture in the Argentine is still very extensive in character and is especially characterized by a simple and very distinct division between the cultivation of the soil and animal husbandry. These two great divisions of agriculture exist side by side and each has its own sphere of action and its own means of accomplishing its work.

Cultivation of the soil. — The owners of the numerous large estates ("estancieros"), devote themselves almost exclusively to the raising of livestock; they cultivate the soil only temporarily and then only indirectly by means of colonists' families and only with the object of improving the food supply for the stock, i. e. of producing forage, especially lucerne. The still unbroken areas to be put to lucerne, or worn-out lucerne fields are broken up by the colonists and cropped with wheat on the share system. With the last cereal crop, lucerne seed, provided by the estanciero is sown and the colonist pulls down his primitive mud hut and moves on to another part of the estate to repeat the same process. The colonist's agreement with the landowner is usually made in one of the two forms "a medias" and "per tanto". According to the former the owner generally takes half shares both in the outlay for certain items such as seed, reaping and threshing, and in the returns. According to the second system the "tantero" bears all the farming expenses and pays a small percentage of the gross returns to the landowner for the use of the land.

One of the chief causes of the great spread of the share system in the Argentine is the shortage of labour and its high price.

Besides this, the character of the seasons largely affects the demand for labour during the summer over the extensive agricultural tracts.

The cultivation of the soil, as has already been mentioned, is only an accessory object, and has naturally undergone later and slower development than animal husbandry, which has been the prominent feature from the beginning. Only where medium and small holdings are more prevalent, as in the old colonists' centres of the chief provinces, especially in Santa Fé, is there unmistakable evidence of mixed farming. The cultivation of cereals on a large scale by individual owners or by contractors is not very frequent.

Except during the earliest periods of development in the seventeenth and eighteenth centuries, when the Cuyo provinces of Mendoza, San Juan and San Luis provided not only Argentine and Chile but also Brazil with wheat flour, Argentina has until recently been dependent on foreign countries for her corn. It was only in the seventies of last century that the country developed from an importer of cereals into a cereal exporting country, and she has come to occupy one of the most prominent positions amongst such countries in an astonishingly short space of time.

The agricultural area of Argentina was 1 432 620 acres in 1872 and had become 50 306 693 acres in 1910; that is in barely 40 years it had increased more than thirty fold. While the area of the cultivated land in 1872 was only 0.19 per cent. of the total area of the country it attained 6.82 per

in 1910, and, notwithstanding the great progress achieved, this latter shows the great future possibilities of agricultural development in the country. Development has been especially rapid since 1895. Between 1895 and 1910 the cultivated land increased fourfold and the development has been rapid in the central provinces of Buenos Aires, Entre Rios, Santa Fé and Bahía, the cultivated area of which is much greater than that of all the provinces and territories put together.

The export of cereals is due to the unceasing spread of cultivation. At the same time imports rose with the rising exports and it was only in 1877 that the exports were surpassed by the imports.

Table I shows how the value of the exports of animal products gradually exceeded by the products of the soil, till, in 1908, the value amounted to twice as much as the former.

TABLE I. — *Value of exports of plant and animal products from Argentina for the period 1896-1910.*

Years	Plant products (1)	Animal products
	£	£
1896	8 563 085	14 003 079
1897	4 632 955	14 700 308
1898	8 475 799	17 347 820
1899	12 935 379	22 439 457
1900	15 341 406	14 145 990
1901	14 213 929	17 995 976
1902	13 534 012	20 754 090
1903	20 895 477	21 675 704
1904	29 844 630	20 917 973
1905	33 796 696	28 001 177
1906	31 299 088	24 644 730
1907	32 577 008	24 581 949
1908	47 980 018	22 854 396
1909	45 761 815	30 483 860
1910	39 046 835	31 964 539

Exclusive of forest products.

Agriculture in Argentina presents a rich variety of cultivated plants, as may be seen from Table II, which shows the increased area of the various crops since the beginning of the seventies of last century, a period which may be considered as the starting point of the recent agricultural development of the country.

TABLE II. — *Increased acreage of various crops, 1872-1909.*

Crops	Cultivated area in acres.				Percent of increase in the 37 years
	1872	1888	1895	1909	
Wheat	(1) 180 627	2 015 021	5 064 951	14 422 690	+ 11
Maize	322 304	1 980 796	3 074 491	7 425 625	+ 14
Flax	84	?	357 112	3 596 919	+ 27
Oats	—	—	?	1 414 946	+ 19
Barley	4 233	?	134 857	148 293	+ 1
Lucerne	261 397	963 747	1 762 112	11 630 259	+ 58
Potatoes	5 834	?	52 100	119 882	+ 12
Pulse	9 254	?	51 401	64 248	+ 3
Wine	9 019	63 393	82 680	302 607	+ 26
Sugarcane	6 062	52 046	151 411	174 830	+ 1
Tobacco	8 552	?	39 031	23 391	+ 1
Cotton	996	30	2 172	4 295	+ 5
Earthnuts	5 901	?	33 298	29 530	— 1
Vegetables	—	?	58 216	93 901	+ 6
Trees in general	—	89 268	504 656	1 641 819	+ 22
Other cultivated plants	70 406	912 406	120 093	5 302 247	+ 43
Total cultivated area (3)	1 433 252	6 076 707	12 088 582	46 395 634	+ 28

(1) This figure is too low, since the provinces of Buenos Aires, Entre Rios and Rioja, for which no statistical data could be obtained, are not included.

(2) The acreage under oats was not ascertained in 1872 nor in 1888 and 1895. The calculation of the percentage of increase is based on an estimate made in 1896, according to which the area was 95 401 acres.

(3) These figures are taken from official returns.

The class "other cultivated plants" consists almost entirely of grass leys, which in the year 1909 amounted to 5 154 008 acres. But also the increase has been very considerable since 1895.

The great extent of the Republic, embracing various climates, is a reason for the diversity of crops cultivated. Together with the common cereals and forage crops, vines and subtropical and tropical plants grow to perfection. The rapid and extensive spread of wheat, the chief Argentine cereal, in comparison with that of subtropical and tropical plants, is due not only to favourable natural conditions, but also to the excellent position, as regards means of communication, of the principal wheat belt (Central Argentina). The same is true within certain limits of maize and lucerne. In 1909 these three plants occupied more than two-thirds of the whole cultivated area of the country.

On the other hand the chief territory in which tropical and subtropical crops, such as cotton, tobacco and coffee, are raised, namely Northern Argentine, lies at a greater distance from the European market and is far less well provided with means of communication than the coastal zone. With the recent opening up of the large northern belt, however, the cultivation of tropical and subtropical crops is sure to increase rapidly, as the natural conditions are decidedly favourable.

Sugarcane is very important in the Argentine. The economic organisation of the province of Tucuman, which is the chief centre of its cultivation, is based upon it. Jujuy and Chaco come next in order of importance, at a distance, Santa Fé, Corrientes, Santiago del Estero, Salta and Formosa.

Vine growing is also important; whilst in 1872 the total acreage of vines was only 9016 acres, in 1888 it was 63 360 acres, in 1895, 80680, in 1909, 302 509 acres. Between 1895 and 1909 the area under vines had quadrupled itself. More than three-quarters of this area is situated in the provinces of Mendoza and San Juan, the former with 119 848 acres, the latter with 119 680 acres.

Live stock in general. — Table III shows the development of live stock in the Argentine between 1888 and 1908.

TABLE III. — *Head of live stock 1888-1908.*

	Year			Percentage of increase or decrease		
	1888	1895	1908	1888-1895	1895-1908	1888-1908
Cattle	4 262 917	4 445 859	7 531 376	4.29	69.40	76.67
and asses.	430 940	483 369	750 125	12.17	55.19	74.07
Sheep	21 963 930	21 701 526	29 116 625	— 1.19	34.16	32.57
Horses	66 701 097	74 379 562	67 211 754	11.51	— 9.64	0.77
Pigs	403 203	652 766	1 403 591	61.15	115.02	248.11
Goats	1 969 765	2 748 860	3 945 086	39.04	43.52	100.28

The province of Buenos Aires, by far the largest of all, possesses more than one-third of all the cattle, one-third of the horses and upwards of one-half the stock of sheep and pigs of the whole Republic. On the other hand the last but one of all the provinces with regard to its stock of mules and asses and the last of all for goats. As for the value of the live stock, the province of Buenos Aires owns more than half the total. It is followed by the provinces of Santa-Fé, Entre Rios, Corrientes and Cordoba. Among the territories La Pampa occupies the foremost position.

The live stock at present existing in the Argentine Republic has been greatly improved by the introduction of European blood. The number and value of animals imported for breeding purposes between the years 1880 and 1911 is shown in Tables IV and V.

(1) Unfortunately no reliable official statistical data as to the imports of breeding stock before 1880 are available.

TABLE IV. — *Number of live stock imported into the Argentine Republic between 1880 and 1907.*

Exporting country	Cattle	Horses	Asses	Sheep	Pigs	Goats
England	14 477	3 102	352	65 947	1 945	—
France	583	1 580	112	1 184	3	—
Germany	153	120	—	3 327	12	—
Belgium	325	156	—	209	56	—
Holland	50	26	—	10	14	—
Spain	42	84	839	128	4	—
Italy	62	79	57	56	6	—
United States	169	28	9	504	161	—
Australia	—	—	—	125	—	—
Various	10	11	—	33	5	—
	15 871	5 186	1 369	71 523	2 206	1

TABLE V. — *Value of live stock imported into the Argentine Republic between 1880 and 1907.*

	Total value £	Average value head £ s d
Cattle	796 330	50 4 1
Horses	344 640	66 9 4
Asses	32 821	25 19 1
Sheep	715 079	10 0 0
Pigs	19 617	8 17 3

The total value of the animals imported into Argentina between 1880 and 1907 amounts to upwards of £1 900 000, the greater part of this sum going to England as the chief purveyor of the best live stock.

Horse breeding. — For centuries breeding was left almost entirely to nature without any human interference. Natural selection produced the native Criollo horse, which was extraordinarily hardy and resistant. In the second half of the nineteenth century this primitive system of horse breeding underwent a great and unfavourable change owing to the enclosure of pastures with the formation of "bretes" or corrals, to the ruthless decimation of the herds of horses for their hides and to the slaughter of thousands of the best and heaviest horses for the numerous tallow factories. On the other hand the importation of the best European breeds, which commenced in the second half of the nineteenth century and increased rapidly, had a lasting effect and considerably modified

criollo horse. Vast tracts of country are now stocked no longer by pure os, but by heterogeneous crossbreds, compared with which the number re-breds raised on the most up-to-date estancias is relatively small. Thoroughbreds are the only type of light horse which has acquired importance in the Argentine Republic, owing to the passionate interest taken by the population in horse racing. No other country has invested considerable sums in Thoroughbreds in so short a time. Amongst the breeds of light horses introduced into the country, Hackneys undoubtedly take the lead. They are bred now with the greatest care in a number of the best estancias. From a purely zootechnical point of view their introduction has been one of the most successful in the Argentine; nevertheless their popularity has never spread and their distribution today is very localised and confined to the neighbourhood of the great metropolis, Buenos Aires. The other types of light English horses, Yorkshire and Land, have not acquired any special importance in the Argentine. Anglo-Normans, which have been imported of late years in fairly large numbers, deserve to be mentioned, as they seem to be steadily gaining favour. Other types of light horses have also been imported, such as Friesians, Morgans, Russian and American trotters, Arabs, and, among German breeds, Trakehners, Oldenburgers, Holsteiners, and East Friesians, without great success up to the present, owing in part to the fact that experiments are very recent.

Among heavy draught horses, Clydesdales and Shires, the former especially, have long been most popular, but of late Percherons have become their rivals and have gained much ground in a surprisingly short time owing to their general usefulness and to the good results they have given when crossed with the native breed. Of late years too the English Suffolk has been tried, not without success, and quite recently the Breton, a French brother of the Percheron, has been introduced and seems to become popular. The Belgian breed has only been tried to a limited extent, but has so far given satisfaction and it appears likely to play an increasingly important part in the agriculture of the Argentine.

Cattle. — Of all the branches of animal husbandry none has taken more advantage of the astonishing economic development of the country in cattle rearing. The second half of the nineteenth century with its extensive imports of the best European breeds and gradual elimination of the native Criollo strain represents a period of the great transformation in the Argentine cattle. In the case of cattle also, England is the great purveyor of improved stock, the part played by other countries being insignificant. The supremacy of England as a source of supplies is ensured by the special Argentine National Law, No. 4155, completed by some decrees, especially of January 9 and 16, 1903, which forbid the importation of cattle, sheep, and goats from any other European country.

Of all breeds the Shorthorn, or, as it is generally known in the Argentine the "Durham", is the most widely spread. It is especially suitable for crossing with the native Criollo cattle and is considered now as the impro-

ver *par excellence* of the Argentine cattle. The next in favour, but making a bad second, is the Hereford, which, in spite of great exertions on the part of its partisans, is in no great demand.

The third English beef type is the Aberdeen Angus, representatives of which are not very numerous and mostly met with in the south-western district. Perhaps this breed will spread more when the herds of the country are further improved so that it has a chance of revealing its great quality of producing valuable beef animals when crossed with other breeds.

No other breed has hitherto acquired any importance in the Argentine, neither the small English beef types nor milch cattle, the latter probably account of the edict prohibiting the importation of cattle mentioned above. Among the best known milk breeds, Flemish and black and white Lowland cattle have been in the country for the last twenty years; Jerseys and Ayrshires have not become very popular owing to their lack of size and weight. The beef-producing types are by far the most prevalent, and give the cattle of the country a character of great uniformity. Argentine, with its great estates and its herds running into thousands of head, is eminently adapted to the production of fat beef on its immense pastures.

Sheep. — The importation of improved European sheep began in the first half of the nineteenth century. The first object being to obtain a fine wool, imports from Spain were gradually abandoned in favour of imports of improved sheep from Germany, because breeders in that country have from the beginning devoted themselves to the production of fine wool. In 1836 and 1837 about 4 200 Saxon Elector and Negretti sheep were imported from Germany alone. At first the Electors were the most popular, but, owing to the lack of development of the crossbreds, after 1838 preference was given to Negrettis, which are larger and produce more wool, Germany continuing to be the chief source of supplies. Rambouillet sheep made their first appearance in the country in 1845, but it was only in 1870 that France came up and passed Germany as a source of supplies, without however attaining the high figures. Vermont sheep were also tried, but without much success. The repeated severe crises in the wool trade, and the enormous increase in the number of sheep led the estancieros to seek to make sheep farming more profitable by utilizing skins and tallow in the "saladeros" (salt meat factories) and "grasieras" (tallow factories). Consequently the size and condition of the sheep became more important and the larger and heavier Rambouillet breed was preferred. Meanwhile the increasing exports of live animals and frozen meat, together with the fact that even the somewhat coarser wool of the crossbreds found a sale on the markets, led to a demand for sheep which produced good mutton. In this way English breeds gradually replaced the fine-woolled types of France and Germany, and imports of these breeds soon became considerable. While England had exported to Argentine only 625 sheep for breeding purposes between 1863 and 1881, against 3269 from France and Germany in the next five years, 1882-6 the English sheep numbered 2759 against 1895 French and German.

Lincoln sheep were the favourites and were largely employed for cross-breeding Merinos, so that after a few years their crosses formed the bulk of Argentine flocks; they stocked the rich natural pastures in the province of Buenos Aires, while the Merino sheep were driven into the dry lands of the Central Pampas and of the south. There are still some first class farms in the province of Buenos Aires, but the mass of Merinos are in the above districts. From the Central Pampas the Merinos have gradually southwards to the Rio Negro, Santa Cruz and Patagonia. Common Merinos thrive especially well in Patagonia, which has become an excellent sheep raising country of late years, but which can only produce very high class wool on account of its great remoteness and frequent transport difficulties.

Downey Marsh sheep are at present found only to a limited extent, seem to have a future before them in the Argentine. New Leicesters, Wolds and Cheviots have also been imported, but have not attained any success; neither have the Down breeds made much progress, probably on account of the coarseness of their wool.

Pigs. — Pig rearing is still in its infancy in the Argentine owing to the conditions of land tenure and to the small and uncertain market. It is more developed in the more densely populated agricultural districts, especially where much maize is grown.

Goats. — Goats are not numerous in the Pampas, owing to the predominance of sheep. They are more important in the mountainous parts of the Republic where they often represent a valuable source of income for the farmer. Their most remunerative product is their skins, which command good prices, especially the kid skins.

Poultry. — Poultry keeping is also in a very undeveloped condition in the Argentine.

In a special chapter the writer treats of the work of the "Sociedad Argentina" (the Central Agricultural Association of the Argentine) at the International Agricultural Exhibition of 1910. A further chapter is devoted to the utilization of animal products in the Argentine (salting, exportation of live animals and cold storage).

Utilization of animal products. — At present the production of cold stored frozen meat are the most important methods of utilizing animal products. In 1882 Drabble Bros. erected the first cold storage plant in the Argentine and were soon followed by Sausinena and Son. At first only mutton was stored, beef coming later. Exports began in 1883 with the limited quantity of 17 165 head; in 1885 the number was 108 823, in 1886, 434 699 and three years later it was upwards of a million. Since then the industry has developed rapidly, having been much assisted by the State.

At present the cold storage industry in the Argentine employs upwards of 1000 hands, and its working capital amounts to about £10 000 000. While in 1887 the value of the salted meat was 48 per cent. of that of the total quantity of animal produce exported, twenty-three years later it sank to only 2.5 per cent. On the other hand cold-stored beef, which was ninth

on the list in point of importance in 1887, now occupies the first place. the place of jerked beef (asajo) more valuable products have appeared, the total value of exports has risen uninterruptedly and sometimes with great rapidity.

The price of refrigerated and frozen meat delivered on board at Buenos Aires is as follows :

	Price per lb.
Frozen beef	2.83 d
Refrigerated beef	3.37 "
Frozen mutton	3.79 "
Freight to London and Liverpool:	
Frozen meat	0.37 "
Refrigerated	0.51 "

Dairying. — The total number of dairying firms in the Argentine risen from 324 in 1903 to 896 in 1909, but the whole industry is still in early stages. Really intensive dairying does not yet exist and cannot on the large open grazing tracts and the lack of suitable labour as well as thin population making the country in its present condition unsuitable for the development of the industry.

The milch cows are mostly crossbred Shorthorns and are milked in a rather primitive fashion, often only once a day, in the morning and they have suckled their calf. The yield of milk is low, at most 1.54 to 1.76 gallons during the first period of lactation and 0.44 to 0.66 gals. a day on an average. Breeding for milk is as yet scarcely known in the Argentine, and would be hardly justifiable at present.

Of late the Government has seemed disposed to pay more attention to the question of dairying, and the recently founded "Oficina de Industrias Lechera y Refrigeracion," which forms part of the Ministry of Agriculture is beginning to show much activity. On its initiative the first milk and cream association has been instituted at Germania ("Sociedad de Contralor la Produccion lechera de Germania") with help from the River Plate Dairies Company (a large company of English and Argentine capitalists), who possess in the provinces of Buenos Aires, Santa Fé, Cordoba and Entre Rios 45 creameries driven by steam and a capital of 500 000 pesos g (£ 102 940). It makes butter, cream, and casein, and raises pigs in the but factories (mantequeras) of Buenos Aires, Rosario, Santa Fé and Entre Rios.

A concluding chapter contains a description of typical farms and an extensive bibliographical review is given in the form of an appendix.

AGRICULTURAL
SHOWS AND
CONGRESSES

491 — Agricultural Shows.

Belgium.

1914. Oct. 24-26. Louvain. — Second International Poultry Show, organized by the "Association des Poultryeurs de Louvain".

France.

1914. Oct. 1-4. Angoulême. — General show of horticultural products and of the arts and industries depending on horticulture, organized by the "Société d'Horticulture et de Viticulture de la Charente". M. Lotte, 98 rue de Bassau, Angoulême.

Dec. (2nd half). Paris. — Twenty-fifth Poultry Show of the "Société nationale d'Aviculture de France".

Germany.

(Summer). Breslau. — Annual show of the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft).

March 19-21. Magdeburg. — Third fat stock show; will include also rabbits, agricultural machines, butcher's tools and foodstuffs.

Hungary.

September. Budapest. — Show of agricultural machines, organized by the "Köztelek" Agricultural Society of Budapest.

Norway.

Sept. 20-28. Christiania. — Exhibition of agriculture, mechanical cultivation and domestic economy, held during the Norwegian Centenary Exhibition (May 15 Oct. 15).

Russia.

Sept. 18-Oct. 4. Rostov-on-the-Don. — Agricultural and industrial show, organized by the Imperial Agricultural Society of the Don-Kuban-Terek.

Spain.

July-October. Tortosa. — International Exhibition of Agriculture, Viticulture and Hygiene.

- Agricultural Congresses.

France.

Nov. 3-6 (probable date). Melun (Seine-et-Marne). — Nineteenth Annual Congress of Chrysanthemists, held by the "Société française des Chrysanthémistes". At the same time the "Société d'Horticulture de Seine-et-Marne" will organize a show of all horticultural products.

Dec. 4-5. Paris. — First National Congress on Agricultural Labour, organized by the "Société nationale de protection de la main-d'œuvre agricole." There will be six sections: 1) Legislation on rural wages and insurance. 2) Popular agricultural instruction. 3) Credit on property, housing, hygiene. 4) Labour exchanges. 5) Minor agricultural industries. 6) Métyage and various lease contracts.

Italy.

August (end). Genova. — International congress on the wine trade, held by the local committee, in agreement with the presidency of the International Committee on the Wine Trade (Paris). There will be two long excursions, one to the vermouth districts and the other to Marsala.

CROPS AND CULTIVATION.

- Determination of Air Temperatures. — HELLMANN, G. in *Bericht über die Tätigkeit des Königlich Preussischen Meteorologischen Instituts im Jahre 1913*, pp. 46-51. Berlin, 1914.

Two aspiration thermometers (Aspirationsthermometer) were set 1.5 metres (5ft.) apart in a meadow belonging to the Meteorological observatory at Potsdam. One was one metre (3 ft. 3 in.) from the surface of the grass, which was kept closely mown, and the other was two metres (6 in.). Readings were taken by means of a telescope every second, daily for periods of ten minutes. From the results obtained, the writer made the following conclusions:

on the list in point of importance in 1887, now occupies the first place. The place of jerked beef (asajo) more valuable products have appeared the total value of exports has risen uninterruptedly and sometimes with great rapidity.

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1. On days of active radiation, the temperature of the air at midday vary from 1° to 1.5° C. (1.8° to 2.7° F.) per minute at a distance of one to two metres from the surface of the soil. Changes of 0.4° or 0.5° C. or 0.9° F.) in 10 to 15 seconds are not infrequent.

2. Variations of temperature during the hours of strongest sun (i. e. 7 a.m. to 1 p.m.) are greater at one metre from the surface of ground than at two metres.

3. Usually during those hours, the temperature is higher at one metre than at two metres from the surface, but frequently this order is reversed showing the presence of both ascending and descending currents of air.

4. In the early part of even hot days in summer (7 a.m. to 9 a.m.) large variations are rare, and during the colder months of the year the thermometer hardly varies 0.05° C. in several minutes.

It follows from the above conclusions that a single reading on a thermometer when radiation is very active is likely to give erroneous results and should be replaced by the mean of a large number of readings taken at frequent intervals. On the other hand one single reading will be sufficient on clear or windy days. Further, two metres is a better height at which to place thermometers than one metre, as violent fluctuations of temperature due to radiation and reflexion from the soil are less noticeable at two metres than at one. It would appear, therefore, that the English practice of placing thermometers at 4 feet from the surface of the ground would not give good results as that observed in other countries of placing them at 6 ft.

494 - **Chemical Composition of Rain in South Africa.** — JURITZ, C.F. in *The African Journal of Science*, Vol. X, No. 7, pp. 170-193. Capetown, March 1911.

These determinations of the chemical composition of rain in South Africa were begun in 1910 as part of the scheme for the examination

TABLE I.

Locality	Period	Total rainfall in inches	Pounds per acre			Ch
			Nitrogen			
			as ammonia	as nitrates	total	
Grahamstown	Aug. 1911 to July 1912	26.59	1.030	0.726	1.756	23.
»	Dec. » to Nov. »	22.14	0.858	0.735	1.593	23.
Kokstad . .	Jan. 1912 to Dec. »	26.54	1.118	0.670	1.788 (3)	—
Bloemfontein	Sep. 1910 to Aug. 1911	27.82	3.658	1.620	5.278	61.
»	Sep. 1911 to Aug. 1912	15.49	4.870	1.363	6.233	21.
Durban. . .	Jan. » to Dec. 1911	42.34	3.651	1.234	4.885	61.
»	Jan. 1912 to Dec. 1912	31.07	3.906	1.249	5.155	70.
Cedara. . . .	» » » » »	26.68	4.710	0.865	5.575	161.

(1) Not including Aug. and Dec. 1911, and May 1912. — (2) Not including Dec. and May and Aug. 1912. — (3) Excluding 0.25 inch of rain during Sept. 1912. — (4) Including March 1912. — (5) Excluding 0.2 inch of rain during June 1911. — (6) Excluding 0.1 inch of rain during June 1912.

fall in all parts of the world initiated by Dr. MILLER. The determinations were carried out at 8 stations, adopting uniform methods of collecting and analysing the rainwater. Precautions were taken to prevent contamination by dust and by the excreta of birds. The results obtained are summarised in the tables (I and II):

TABLE II. — *Comparison of nitrogen content of summer and winter rains.*

Locality	Period	Nitrogen in pounds per acre					
		Summer: Sep. to Feb.			Winter: March to Aug.		
		as ammonia	as nitrates	total	as ammonia	as nitrates	total
San Juan	Sep. 1911 to Aug. 1912	0.592	0.465	1.057	0.448	0.264	0.712
Bloemfontein	" 1910 to " 1911	1.425	0.907	2.332	2.233	0.713	2.946
"	" 1911 to " 1912	3.244	1.077	4.321	1.626	0.286	1.912
etc.	" " " "	2.739	0.780	3.519	1.796	0.295	2.091

Table II shows an increase of nitric nitrogen during the summer months. During 1910-11 considerably more nitrogen was brought down as ammonia at Bloemfontein in winter than in summer, but during the following year this irregularity disappeared.

— **The Red Clay Soil of Porto Rico.** (2) — GILE, P. L. and AGRESTON, C. N. — *Porto Rico Agricultural Experiment Station, Bulletin No. 14*, pp. 1-24. Washington, March 1914.

The red clay is one of the most widely distributed types of soil in the island of Porto Rico. It is a fairly heavy clay resting on an impervious subsoil and contains a high percentage of iron and aluminium but no carbon, being almost invariably acid and deficient in organic matter. Usually it responds to manuring and more especially to applications of lime, but in some areas, which have been continuously under sugarcane, are in a "clay" condition and respond neither to manuring nor to liming. The reason for this condition is unknown, and the results of analyses of the organic matter of these soils carried out by the U. S. Department of Agriculture failed to account for the observed facts.

— **Methods in Soil Bacteriology, VII: Ammonification and Nitrification in Soil and Solution.** — LÖHNIS, F. and GREEN, H. H. (Laboratorium für Bakteriologie am Landwirtschaftlichen Institut der Universität Leipzig) in *Centralblatt für Bakteriologie etc., II Abt.*, Vol. 40, No. 19/21, pp. 457-479. (Article written in English). Jena, April 4, 1914.

In a series of ammonification trials the influence of aeration on the process was investigated by using different depths of liquid medium, blood being the basis of the nitrogen supply. It was found that this factor of less importance than was expected, and that the low ammonification

¹⁾ See No. 100, B. Feb. 1914.

of substances in deep layers, such as has been previously noted, only be due in part to the anaerobic conditions prevailing. In a second series of trials, the decomposing material was not only placed in a liquid medium but also distributed over various solid media, such as soil, sand, glass, glass wool, and this factor of distribution appeared to be of considerable importance, as ammonification was always more active when solid media were employed than it was in a liquid medium.

Nitrification trials showed that the activity of this process in liquid media decreases as the depth of the medium increases, and when the soil was spread out in a film 2 mm. thick, the results were similar to those obtained when soil was used as medium. The concentration of ammonia in the liquid medium appeared an important factor, small amounts of nitrate being formed with 0.1 per cent. ammonium sulphate and 0.1 and 0.3 per cent. magnesium ammonium phosphate ($MgNH_4PO_4$), but the amount being reduced when 0.2 per cent. ammonium sulphate was used. The presence of basic magnesium carbonate proved distinctly inhibitive.

497 - **The Absence of Nitrate Formation in Cultures of Azotobacter**
KELLERMAN, K. F. and SMITH, N. R. (U. S. Department of Agriculture, Washington, D. C.) in *Centralblatt für Bakteriologie etc., II Abt.*, Vol. 40, No. 19/21, pp. 47-48 (Article written in English). Jena, April 4, 1914.

Recently there has appeared a report (1) of observations upon the growth of cultures of species or varieties of *Azotobacter* recording the formation of nitrate, presumably resulting from the activity of the cultures under discussion. Professor Jones supplied the writers with cultures of four strains which he considered to possess the ability of forming nitrate; these were grown in Ashby's solution both with and without the addition of potassium nitrate, and at stated intervals careful examinations were made both of the presence of nitrate and for the gain in total nitrogen due to the fixation of atmospheric nitrogen. The results indicated clearly that while some strains were capable of fixing appreciable quantities of free nitrogen, others were apparently unable to produce nitrates.

498 - **The Mechanism of Denitrification.** — HULME, W. (Manchester University) in *Journal of the Chemical Society*, Vols. CV and CVI, No. 617, pp. 623-632, March 1914.

Four flasks of culture media were prepared, containing respectively

1	2	3	4
Peptone . . 0.5 %	Peptone . . 0.5 %	Peptone . . 0.5 %	Peptone . . 0.5 %
Meat extract 0.5 %	Meat extract 0.5 %	Dextrose . . 0.5 %	Dextrose . . 0.5 %
Pot. nitrate . 0.5 %		Pot. nitrate . 0.5 %	

and were inoculated with pure cultures of denitrifying organisms isolated from dried sewage filter deposit. The gases formed by the fermentation were collected and analyzed.

(1) JONES, D. H., A morphological and cultural study of some *Azotobacter*. — *Centralblatt für Bakteriologie, II Abt.* Vol. 38, pp. 14-25, 1913.

collected, measured and analysed. After 20 days they had the following composition :

Flask	cc. of gas formed	Hydrogen %	Nitrogen %	Carbon dioxide %
containing nitrate	39	—	98.83	3.17
	36	—	98.59	1.41
containing no nitrate	26	70.14	—	29.86
	53	73.17	—	25.83

Flasks 1 and 3 were also shown to contain nitrite.

From these results it would appear that reduction of nitrate is brought about by the action of nascent hydrogen, for though hydrogen is the chief constituent of the gas evolved from flasks 2 and 4, which contain no nitrate, in the presence of nitrate the gas of fermentation consists almost entirely of nitrogen. This conclusion was confirmed by another experiment in which the medium fermented contained a weaker solution of nitrate (per cent.). So long as nitrite was present in the fermenting solution the gases formed consisted of nitrogen and carbon dioxide, but as soon as the reduction was complete and nitrite could no longer be detected in the fermenting solution, then the gases formed consisted of hydrogen and carbon dioxide.

In order to determine whether enzymes played any part in denitrification, sterile enzyme solutions were prepared from the four above cultures. The media were precipitated with alcohol and salt, and the precipitate was dried, redissolved, and filtered through a Chamberland filter. A few cc. of these enzyme solutions were then added to tubes containing 5 cc. of a 1 per cent. solution of potassium nitrate and incubated 24 hours, after which the nitrate present was estimated quantitatively:

Flask	Mgm. of nitrogen as nitrite		
	Nitrate sol. alone	Enzyme sol. alone	Nitrate + enzyme sol.
.....	0.005	0.01	0.03
.....	0.005	—	0.02
.....	0.005	—	0.01
.....	0.005	—	0.01

These results seem to show that the denitrification of a medium containing nitrates and peptone under anaerobic conditions yields an enzyme

which has the power of reducing a 1 per cent. solution of potassium nitrate. The reduction obtained with the enzyme solutions from flasks 2 and 4 was probably due to a purely chemical reduction of the nitrate by the organic matter present in the solution.

Further enzyme solutions were prepared from a nitrate broth undergoing denitrification: a) after the fermentation had progressed for four days and the culture medium contained a considerable quantity of nitrite, b) when the fermentation was complete and all the nitrate and nitrite had been decomposed; both were tested for enzyme action as before and the results showed that the denitrification of nitrate broth under semi-aerobic conditions involved the production of an enzyme as long as nitrate or nitrite were present in the solution, but that the enzyme disappeared when nitrate and nitrite had been decomposed.

Finally, other enzyme solutions were prepared from culture media, some of which had been inoculated with denitrifying organisms while others remained sterile, in order to determine whether the reducing product obtained from denitrifying solutions was really due to bacterial influence or whether it would also be produced in a flask containing similar ingredients and treated in exactly the same way, but which all the while remained sterile. The enzyme solutions were tested as before and the results definitely showed that the reducing product was due entirely to bacterial action and was not a purely chemical product.

499 - **The Functions of the Non-Bacterial Population of the "Bacteria I"**
— CRASTREE, J. (Manchester Sewage Works, Withington) in *Centralblatt für Bakteriologie Abt. II*, Vol. XL, No. 11/13, pp. 225-239. Jena, March 2, 1914.

Three experimental contact filter beds were prepared as follows: the socket ends of three earthenware sewer pipes, 2 ft. 6 in. long by 6 in. diam., were filled with concrete to form a bottom, and a hole was bored at the base of each to form an outlet. They were then filled with clinkers 0.25 in. to 0.75 in. in size, and received the effluent from the settlement tank twice daily except Saturdays and Sundays when only one filling was given. The contact lasted two hours each time. Of the three beds, A served as control, B was subjected repeatedly to partial sterilization by filling the tank with a saturated solution of toluene in water, and C was at first run as a duplicate of A but later was also tolued. The beds were examined occasionally and the effluents constantly, subjected to analysis, chemically by estimation of free ammonia and nitrates and by the oxygen absorption test, and biologically by the plating out of bacteria on gelatine and by counting protozoa by means of a plankton counting chamber. Further, a preliminary set of experiments showed that the bacterial content of the effluent varied with that of the bed medium and could therefore be used to indicate the bacterial condition of the latter without continual disturbance of the bed.

During the first two months the beds all received the same treatment and the analyses showed that the three beds were similar in every respect. On the 67th day from the start B was tolued for the first time.

ect of this on the effluent was first a drop, then a large increase in the number of bacteria growing on gelatine, and a decrease of the percentage purification. The bed, however, recovered comparatively quickly and was practically normal again at the end of a week. The treatment was repeated at intervals varying from 7 days to 3 weeks, always with the same results, the effluent from B never reaching the same degree of purification as that from A. After eight months, B produced for the first time an effluent better than A. This occurred 56 days after previous toluene treatment and from that time forward the superiority of B's effluent was maintained in spite of repeated treatment with toluene.

At the end of the 13th month the protozoa in B were reduced to 760 per cc. of the bed medium, while A contained 2240 per cc., but a series of bacterial counts carried out during the 12th and 13th months indicated that the number of bacteria in the effluent from B was only slightly higher than the number in the effluent from A. It was therefore difficult to attribute the superiority of B over A to the increase of bacteria owing to the removal of the animal population. When, however, the capacities of the two beds were compared, a considerable difference was observed between A and B. While the original capacity of A had only been reduced 7.06 per cent by the 13th month, that of B had been reduced 15.7 per cent, and the difference of the surface deposit on the clinkers was evident to the naked eye, that of B being finer and more spongy, while that of A was more granular. But this reduction in capacity and change in the character of the surface deposit, which may be ascribed to the removal of the animal forms, would improve the purity of the effluent by increasing the surface of the bed, and would consequently account for the superior results given by B over A.

During the 13th month, C as well as B was tolued, and confirmed the results obtained with B at the start. In a last set of experiments, when the alk effluent was replaced by a dilute peptone solution (1 part of albuminoid ammonia per 100 000) in order to eliminate the effect of the continual addition of extraneous organisms and colloid matter, the tolued bed C showed greater purification than the untreated bed A, while, at the same time, the capacity of A increased and that of C did not, owing to its animal population attacking and removing the solid deposit.

Thus the animal population of a contact bed helps to keep the latter clean and from this point of view is desirable, but outside this effect it seems to have little influence on the actual purification processes taking place. The increased number of bacteria capable of growing on gelatine which were present in the beds after toluene treatment was not correlated with a higher degree of purification, and the writer suggests that counts on nutrient gelatine do not necessarily indicate the number of bacteria involved in the purifying processes, for growth on gelatine is chiefly a putrefactive process, while purification is chiefly an oxidation process. In this connection, the work of MÜLLER is referred to, where it is shown that protozoa in contact reduce the number of bacteria capable of growing on gelatine, but do not affect those growing on albumose agar; from this the conclusion is drawn that protozoa prey only on bacteria foreign to water (*B. coli*,

B. typhosus, etc.) and leave the normal population untouched. Applying this idea to the case of sewage, very suggestive results were obtained by placing effluents simultaneously on gelatine and albumose agar, when the order of the counts obtained from beds A and B was reversed. The writer on puts forward this explanation tentatively, as the experimental evidence on which it is based is still very slight; but according to it, the removal of protozoa would not only reduce the capacity of a bed but would also tend to decrease its power of purification by allowing the increase of putrefactive organisms and a consequent decrease of the normal population. The better results obtained with B than with A after eight months being solely attributed to the increased surface of bed B. But in any case, the continual addition of sewage rich in all classes of bacteria must tend to keep the population fairly stable and tend to nullify any selective effect which the protozoa may possess.

500 - **The Manurial Value of Phonolite** (1); — NEUMANN, R. in *Fühling's Landwirtschaftliche Zeitung*, Year 63, Part 8, pp. 278-291. Stuttgart, 1914.

It has already been demonstrated by a number of pot and field experiments that phonolite possesses a certain manurial value, which, however, cannot be compared with that of the common potash manures, because of its insolubility, and the use of ground phonolite has therefore been deemed inadvisable owing to its high price and limited efficiency.

In 1912 a new phonolite appeared on the market, the "Vulkanphonolith", which was claimed to be more valuable than those previously known and to possess the property of fixing nitrogen. In spite of repeated warnings against it from competent quarters it succeeded in gaining footing in several countries. In order to give greater weight to its warning the Experimental Station of Hohenheim started a series of pot and field experiments with the new phonolite in the autumn of 1912. The investigations were planned: 1) to compare the values of phonolite and kainit as potash manures by the addition of kainit on the one hand and phonolite on the other to a fundamental manuring of basic slag and nitrate of soda; and 2) to ascertain the existence of the alleged nitrogen-fixing property by comparing an unmanured soil with one treated with phonolite. The plants used were winter and spring barley and mangolds. The fertilizers used had the following composition:

Vulkan-phonolith:

- 7.3 per cent. total potash (soluble in hydrofluoric acid).
- 5.0 " " potash soluble in hot concentrated hydrochloric acid.
- 0.4 " " potash soluble in hot water.

Kainit: 15.1 per cent. K_2O .

Basic slag: 16.3 per cent. citrate soluble P_2O_5 .

Nitrate of soda: 15.3 per cent. N.

(1) See also: No. 233, *B. March* 1913; No. 349, *B. April* 1913; *B. Oct.* 1913, p. 142 original article by Prof. LEMMERMANN: On the Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite, Leucite, etc.

The writer summarizes the results of his experiments and observations as follows:

1. The affirmation that "Vukaln-phonolith" possesses the property of nitrogen fixation has not been confirmed by either the pot or the field experiments.

2. In the barley field the only effect of phonolite was to increase the yield of straw; this increase, however, was greater when the same amount of potash was given under the form of kainit.

3. In these same experiments kainit also gave a large increase in the yield of grain.

4. With mangolds, phonolite produced a heavier crop of roots, but the increase was only apparent, for on examining the amount of dry matter in the crop it was found that there was no real increase. With an equal amount of potash given as potash salts the yield of dry matter was considerably higher.

5. The experiments have failed to prove any superiority of "Vulkan-phonolith" over the other phonolite.

6. *New Investigations with Magnesium.* — MIEGE, E. and COMPAIN, E. in *La Vie agricole et rurale*, Year III, No. 19, pp. 532-533. Paris, April 11, 1914.

Applications of dolomite (having a lime-magnesia ratio of 1.5) were made as follows on plots 0.6 acre in area:

- Plot 1. — Raw dolomite at the rate of $6\frac{1}{2}$ cwt. per acre.
 Plot 2. — Roasted dolomite " " "
 Plot 3. — Lime " " "
 Plot 4. — Control.

The soil was a clay loam having the following percentage composition:

	Soil	Subsoil
Nitrogen	0.18	0.16
Phosphoric acid	0.21	0.20
Potash	0.13	0.09
Lime	0.86	0.65
Magnesia	—	0.35
Iron	4.61	4.89
Organic matter	1.71	1.49
Coarse sand	31.01	32.26
Fine sand	59.58	56.17
Clay	8.53	10.67
Humus	1.28	1.19
Reaction	alkaline	neutral

The manure was hand sown and harrowed in. The land was then ploughed a second time and tankard mangels were sown on June 25. The mangels were harvested on October 29 and yielded the following weights per acre.

Plot 1. — Raw dolomite	25 tons
Plot 2. — Roasted "	26.5 " "
Plot 3. — Lime	28.5 "
Plot 4. — Control	27.5 "

These results show that the dolomite had a distinctly depressing effect on the yield.

502 — Report of the Imperial Economic Botanist for India, 1913. (1) — HOWARD in Report of the Agricultural Research Institute and College, Pusa, 1912-13, pp. 2 Calcutta, 1914.

Wheat Experiments.

The improvement in the quality of Indian wheats has now reached the practical stage and extensive seed farms have been established for distribution of high grade seed to the public. Mr. Humphries, of Incorporated Society of British and Irish Millers, reports that these wheats produce good baking flours equal to those of the Manitoba spring wheats. At the same time both cultivators, landholders and the educated community in India prefer them to their own indigenous varieties.

Experiments in different localities in India have shown that these improved varieties retain their superior qualities whether grown on alluvial soil under irrigation or on the black cotton soils of the Deccan.

Further experiments are in progress with the object of producing strains of Pusa wheats with increased standing power, rust resistance and general hardiness.

Other Investigations.

Tobacco. — A type of tobacco has been found in Bihar suitable for cigarettes. It is known as Type 28 and seed is now being distributed to planters and Government farms in the Central and United Provinces. Partial sterilisation of the seed beds by surface fires has given excellent results in preventing loss of first sowings and seedlings.

The inheritance of characters has been studied and several promising strains have been isolated. It has been shown that the inheritance of quantitative characters as size and shape of leaf follow Mendelian laws.

Gram (Cicer arietinum). — The selection experiments have been continued. The high yielding white strain again gave good results at Pusa and is being tried on the Government farms in the Central and United Provinces.

Fibres. — The study of the inheritance of characters in *Hibiscus Scdarifa* is being continued. A promising strain of *H. cannabinus*, known as type 3, has been grown for fibre with satisfactory results, and seed will be distributed during the season.

Indigo. — This work has been transferred from the Sirsiyah Experiment Station to Pusa. Two problems await solution, viz. methods

(1) See No. 357, B. April 1913.

causing loss of plant due to "wilt" during the late monsoon, and the production of a reliable seed supply in Bihar. The methods of pollination will also be studied with a view to applying modern methods of selection and breeding. Already valuable results have been obtained on the successful treatment of "wilt" and these will be published during 1914.

Development of the Fruit Industry in Baluchistan.

The raising of nursery stock and economy in the use of water for irrigation purposes has been effected. Clover as a green manure has given excellent results. A collection of the most useful varieties of trees from the south of France is being made with a view to future developments.

Tomato cultivation is being attempted on a large scale, the plants being trained on the two-branch system combined with furrow irrigation.

Experiments on the packing and transport of fruits are also being carried out.

Research on Vegetable Physiology: III and IV. (1) — MAZÉ, P. in *Annales de l'Institut Pasteur*, Vol. 27, No. 12, pp. 1093-1143; Vol. 28, No. 1, pp. 21-26. Paris, December 25, 1913, January 1914.

The functions of water. — In a perfectly balanced culture solution, the amount of water transpired by the maize plant in producing a given quantity of dry matter is constant and independent of the concentration of salts in solution. The addition of assimilable organic matter diminishes transpiration, and, in the case of sugar, the amount of dry matter the plant is increased. In an unbalanced solution, an increase in concentration of calcium nitrate from 0.5 to 1.0 per cent., or of sodium chloride from 0.5 to 2.0 per cent., lowers the rate of transpiration, whilst ammonium nitrate and potassium phosphate in excess, increase it.

The rate of transpiration by day is independent of that by night, but at a low temperature in the day-time the nocturnal rate of transpiration is more rapid. The rate of transpiration is also greater during the second half of the night than during the first. Other workers have observed a higher rate of transpiration in plants growing in poor soils, owing to the extension of the roots in the rapidly impoverished soil.

The mechanism of absorption. — In nature the soil solution is never physiologically balanced for the needs of the plants, and only those which open all their seeds at a definite period are able to complete the ripening process in an exhausted solution. Leguminous plants generally show all stages of development at the same time and require a nutritive solution of constant strength. Their roots are therefore sensitive indicators of the condition of a culture medium. In dilute solutions they develop luxuriantly, whilst in unbalanced solutions they grow to an abnormal length and the leaves do not develop at all.

The root is protected against the entrance of soluble substances by the presence of a mucilaginous sheath.

Secretory functions of roots. — The acid reaction of the excretions of roots would be favourable to diastatic action, but though soluble starch

(1) See No. 3108, *B. Nov.-Dec. 1911*; No. 19, *B. Jan. 1914*.

in a culture solution may be absorbed by roots, there is no evidence of formation of invert sugar in the medium. Saccharose in culture medium is partially converted into invert sugar, but sucrase cannot be detected. The leaves and stem contain 78.9 per cent. of invert sugar. It therefore appears that saccharose is absorbed as such, inverted in the leaves and turned to the roots to be excreted as invert sugar.

Conditions of fructification in aseptic solutions. — In 1911, fructification was only obtained in cultures containing sodium nitrate. Under other conditions, the plants appeared to be disturbed during the development of the reproductive organs; several female ears were produced, the major part of which aborted. During the migration of reserves to the fertile ovaries the composition of the nutritive solution requires to be changed to meet the requirements of the plant.

THE INFLUENCE OF MINERAL SALTS ON THE GROWTH OF MAIZE.

The solutions were made with ordinary tap-water, since fructification does not take place in distilled water owing to the absence of traces of certain substances. The influence of calcium carbonate, sulphur, iron, manganese and zinc was studied.

Calcium carbonate. — When calcium carbonate is replaced by calcium chloride in culture solutions containing ammonium salts, the roots show abnormal development and the medium develops an acid reaction. If nitrogen is supplied as sodium or ammonium nitrate, the medium becomes alkaline and abnormal root development takes place. It is therefore necessary that calcium should be present in the form of carbonate. The quantities of iron, manganese, and zinc present in culture solutions would be fatal if supplied as pure solutions in distilled water. They are precipitated by the calcium salts in the culture solution and are only rendered soluble gradually as the culture solution becomes acid or alkaline.

Influence of sulphur and iron. — In the absence of sulphur and iron plants gradually develop chlorosis and become sterile. A drop of solution containing iron or sulphur placed on the discoloured leaves restores the green colour and the functions of the chlorophyll.

Influence of manganese. — The difficulties of depriving a plant of manganese owing to its presence in glass and in the seeds, diminishes the chlorotic effect of its absence from the solution. Solutions of manganese do not restore the discoloration due to manganese chlorosis, but the sap of normal maize plants appears to contain some specific substance which restores the chlorophyll function.

Influence of zinc. — In the absence of zinc, the roots become covered with a yellowish deposit of sulphur. The leaves gradually darken, take on a metallic appearance and become incrustated with mineral matter causing the death of the plant.

Pure solutions of nitrate, phosphate, sulphate and chloride of sodium, potash and lime are only favourable to growth in concentrations between

and 0.1 per cent. Ammonium salts of the same acid radicles are not tolerated at concentrations exceeding 0.5 per cent.

Calcium nitrate appears to favour the development of long roots, thus making a greater depth of soil available to the plant.

The Resistance of Leguminous Seeds to High Temperatures. (Publication of the Faculty of Natural Science of the Royal Hungarian Academy of Agriculture at Magyaróvár). — NEUBERGER, F. in *Közlönyek*, Vol. 17, No. 1, pp. 121-168 (pp. 169-170, German abstract). Budapest, January-February 1914.

The experiments were made with seeds of *Vicia Faba*, *Vicia sativa*, *Aesculus vulgaris*, *Pisum sativum*, *Lens esculenta*, *Medicago sativa* and *Trifolium repens*. The seeds were submitted to the action of dry heat at temperature of 50° to 130° C. for from ½ hour to 6 hours, and to the action of warm water at a temperature of 45° to 100° C. during ½ hour to 6 hours. They were then germinated in a Weinzierl apparatus. The results are summarised in Tables I and II.

The effect of heat on germination is proportional to its intensity and duration. Up to a temperature of 80° C. dry heat acting for a certain length of time is not injurious to germination. Above 80° C. the resistance of the individual seeds of different varieties varies considerably. For any given variety the resistance to heat is inversely proportional to the water content of the seeds, and may be increased to some extent by careful drying. The highest temperature to which leguminous seeds have been subjected without destroying their germinating power is 130° C. Immersion in water at a temperature higher than the maximum temperature of germination has an injurious effect if the immersion takes place before the seeds begin to germinate. The relative resistance of different species may be considered as a characteristic of each species.

According to the writer the injurious action of heat is due to the destruction of enzymes which control the germinating power of the seed. Further researches are being made on this subject.

TABLE I.
Influence of dry heat on the germinating power of leguminous seeds.

	Duration of treatment in hours :												Total percentage germination																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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Influence of warm water on the germinating power of leguminous seeds.

Initial germination capacity %	45°		50°		55°		60°		65°		70°		75°		80° c.						
	Duration of treatment in hours:																				
	Percentage germination																				
	Total of percentage germination																				
Broad beans (<i>Vicia Faba</i>)	100	99	98	97	72	60	0	39	0	66	45	0	33	17	0	13	4	0	3	0	- 646
Haricot beans (<i>Phaseolus vulgaris</i>)	98	100	89	26	0	4	0	1	0	12	0	0	0	0	0	0	0	0	0	0	232
Peas (<i>Pisum sativum</i>)	96	94	78	59	21	24	15	16	8	12	8	0	8	5	0	9	4	0	2	0	363
Lentils (<i>Lens esculenta</i>)	98	97	92	19	3	9	7	5	0	7	3	0	0	0	0	0	0	0	0	0	242
Vetches (<i>Vicia sativa</i>)	100	100	98	89	80	62	41	53	33	69	53	28	73	42	15	53	18	4	4	0	915
Lucerne (<i>Medicago sativa</i>)	90	88	93	76	31	25	8	14	7	9	4	0	6	8	0	4	3	0	1	0	377
White clover (<i>Trifolium repens</i>)	91	90	85	89	47	9	5	10	4	13	5	0	15	7	0	12	4	0	3	0	398

505 - **The Survival of Plant Tissues after Frost.** - RUSSEL, W. in *Comptes-Rendus l'Académie des Sciences*, Vol. 158, No. 7, pp. 508-510. Paris, February 16, 1914.

Plant cells contract under the influence of cold, and the water passes through the cell-walls, freezes in the intercellular spaces (1). The thick-walled parenchyma is dislodged by the accumulation of ice, and the protoplasts are deformed and often crushed soon after disorganisation of the protoplast through loss of water. This disorganisation rarely affects the whole of the parenchymatous tissue; the vascular tissue, the endodermis and the pericycle generally persist, whilst the lignified and corky parenchyma often remain unchanged.

It is generally believed that plants which are not able to resist severe cold, show no living tissues after a thaw. The writer, however, using Ruzicka's reagent (2), has shown the presence of living cells amongst disorganised tissues, and in the slightly injured tissues numerous cells take up the red stain characteristic of living protoplasm.

The damaged tissues may continue to live a considerable time after a thaw, and this is borne out by the fact that plants do not perish immediately, however wilted and disorganised their organs may appear, but continue to live several days or even weeks (3).

Plants with living cells in the vascular tissues and adjacent parenchyma only succumb very slowly; the xylem and phloem parenchyma is the tissue to be destroyed. Thus, a specimen of *Sonchus oleraceus* destroyed by frost at the end of December, still contained living cells on February 9th in the thick lignified cork ring at the base of the hollow stem, which had been completely decorticated.

Thus, the death of a plant through frost does not take place suddenly but rather cell by cell, and is retarded proportionately to the amount of undamaged tissue.

506 - **The Effects of the Winter of 1913-1914 on Certain Plants.** - MOTEI, *Revue Horticole*, Year 86, No. 9, pp. 202-204. Paris, May 1, 1914.

During the winter 1913-14, the soil in the neighbourhood of Paris was frozen to a depth of from 12 to 14 in. Of the newly introduced plants the DR VILMORIN experimental ground at Verrières, those from China completely resisted the cold.

A list of the plants damaged by the frost is given below, grouped according to the extent of the damage.

(1) PRILLIEUX, Effect of frost on plants (*Bull. Soc. Bot.*, 1869) - MUELLER-THOMAS, *Landwirtsch. Jahrb.*, 1883 and 1886. - MOLISCH, Ueber das Erfrieren der Pflanzen, *Journ. Bot.* - MOLLARD and MATRUCHOT, Action du gel sur les cellules (*Revue gén. de Bot.*, 1909). - P. SORAUER, Wärmemangel. (*Handbuch der Pflanzenkrankheiten*. I. I. 1909).

(2) V. RUZICKA, Ueber tinktorielle Differenzen zwischen lebendem und abgestorbenem Protoplasma (*Arch. ges. Physiol.*, T. CVII, pp. 437-534).

(3) Observations on *Papaver Rhoeas*, *Sisymbrium officinale*, *Cheiranthus Cheiri*, *Hum. pratense*, *Achillea Millefolium*, *Ballota foetida*, *Lamium album*, *Euphorbia silvestris*, *Mercurialis annua*, *Urtica urens*, etc.

A. — WOODY PLANTS.

1. Plants completely frozen.

<i>Asaphylos arguta.</i>	<i>Stranvassia glaucescens.</i>
<i>Adelia macrostachya yunnanensis.</i>	<i>Pittosporum undulatum.</i>
<i>Pinus purpureus.</i>	<i>Pinus longifolia</i>
<i>Pinus hirsutus.</i>	» <i>Monterumae</i> var. <i>Lindleyi.</i>
<i>Genia apiculata.</i>	» <i>oocarpa.</i>
<i>Peridopsis corallina.</i>	» <i>microphylla.</i>
<i>Pinus Cunninghamii.</i>	» <i>Lumholtzii.</i>
<i>Aria macrodonta.</i>	» <i>pseudo-Strobis</i> var. <i>tenuifolia,</i>

2. Plants badly damaged.

<i>Andinaria Falconeri.</i>	<i>Helianthemum roseum.</i>
<i>Andinaria humilis</i> var. <i>gracilis</i>	<i>Teucrium fruticos.</i>
<i>Ces religios.</i>	<i>Pinus Montezumae.</i>
<i>Pinus Nagashima.</i>	» <i>patula.</i>
<i>Penstemon californica.</i>	» <i>Teocote.</i>
<i>Aspernum prostratum.</i>	» sp. 6956 M. V. China.
<i>Andevilla suaveolens.</i>	

Plants having their leaves or only their extremities frozen.

<i>Andinia Henryi.</i>	<i>Elaeagnis Simonii.</i>
<i>Andinia candida.</i>	<i>Keteleeria Davidiana</i>
<i>Andinia auricon.</i>	<i>Myrsine africana</i>
» <i>Simonii</i> Chinese var.	<i>Nandina domestica.</i>
<i>Pinus microphylla.</i>	<i>Quercus Suber.</i>
<i>Pinus Armandi.</i>	» spec. no. 26, Yunnan.
<i>Pinus allonia pulverulenta.</i>	» » no. 11, Tonkin.
<i>Pinus spicata.</i>	<i>Xylosma</i> sp. 7220 M. V. China.
<i>Pinus elliptica.</i>	New genus, no. 4395, Wilson.
<i>Salix coccifera</i> (1).	

B. — HERBACEOUS PLANTS.

1. Plants completely frozen.

<i>Themis montana.</i>	<i>Erodium pelargonifolium.</i>
<i>Ando conspicua.</i>	<i>Rehmannia an-ulata</i> and hybrids.
<i>Ando ramosa candida.</i>	<i>Salvia dichroa.</i>

2. Plants more or less damaged.

<i>Pinus Vilmoriniana.</i>	<i>Tritoma rufa.</i>
<i>Pinus arborea.</i>	<i>Sisyrinchium striatum.</i>
<i>Pinus polyphyllum.</i>	

Old leaves damaged. Young leaves resistant.

3. Plants of doubtful hardness which have shown complete resistance.

<i>Asimina triloba</i> .	<i>Olearia nummulariaefolia</i>
<i>Abutilon vitifolium</i> .	<i>Pinus koraiensis</i>
<i>Abies bracteata</i> .	" <i>Ayacahuite</i> .
<i>Aristotelia Macqui</i> .	<i>Prumnopitys elegans</i> .
<i>Camellia japonica</i> .	<i>Tsuga Brunoniana</i> .
<i>Clematis cirrhosa</i> .	<i>Rhododendron campylocarpum</i> .
<i>Clematis balearica</i> .	<i>Piptanthus nepalensis</i> .
<i>Clerodendron fatidum</i> .	<i>Rosa laevigata</i> .
<i>Castanopsis chrysophylla</i> .	<i>Rhododendron Griffithianum</i> hybrid
<i>Baccharis patagonica</i> .	<i>Eriobotrya japonica</i> (covered at the
<i>Fuchsia Riccartoni</i> (covered at the base).	<i>Mimosa dealbata</i> (covered at the)
<i>Carrya Thureti</i> .	<i>Zizyphus vulgaris</i> .
<i>Oreodaphne californica</i>	<i>Punica Granatum</i> var. <i>Lezellei</i> .

507 - The Indicator Significance of Vegetation in the Tooele Valley, Uta
 KEARNEY, T. H., BRIGGS, L. J., SHANTZ, H. L., MC LANE, J. W. and ITEM
 R. L. in *Journal of Agricultural Research*, Vol. I, No. 5, pp. 365-417, + 7
 Washington, D. C., February 1914.

This investigation of the correlation existing between the distribution of the vegetation and the physical and chemical properties of the soil, carried out in the Great Basin region between the Rocky Mountains and Sierra Nevada and Cascade ranges. The problems to be solved were 1) what types of vegetation indicate conditions of soil moisture favourable or unfavourable to dry farming, and, 2) what types indicate the presence or absence of alkali salts in quantities likely to injure cultivated crops. For the purpose of this investigation it was necessary to find a locality where both dry farming and irrigation farming are practised, where much of the land is still covered with the original native growth, and where some of the soils contain an excess of alkali salts. The Tooele Valley in Central Utah was selected as representing these conditions. The natural vegetation of this valley consists of a few easily recognisable and sharply delimited plant communities, the distribution of which is largely determined by moisture relations and the salt-content of the soil.

These correlations are summarised in the table opposite.

The sage brush (*Artemisia tridentata*) occurs nearest the mountains where the soil is of a light, permeable texture, rather low in moisture holding capacity, and free from an excess of alkali salts, and where the moisture available for growth is usually exhausted early in summer. A good growth of sage brush indicates suitability for both dry and irrigation farming, where the growth is thin and poor irrigation is necessary.

The Kochia (*Kochia vestita*) association occurs just below the sage brush belt. The soil is of a finer texture, less permeable and with a higher moisture holding capacity, and the subsoil has a higher salt content. Dry farming is precarious owing to the shallow depth of soil free from alkali and its impervious nature hinders the washing out of the salts by irrigation.

Type of vegetation	Source of moisture	Moisture content or below wilting coefficient (%) average of 4 feet	Salt content average to depth of 4 feet	Surface soil	Soil below one foot	Without irrigation	With irrigation
Sagebrush (<i>Artemisia tridentata</i>)	Direct precipitation	— 0.8	0.4	Non-saline, usually dry in summer	Non-saline, usually dry in late summer	Yes	Yes
Sandhill mixed (<i>Artemisia tridentata</i> , <i>Juncus roemerianus</i> , etc.)	do			do	Non-saline, usually moist in summer		
Shadscale (<i>Atriplex confertifolia</i>)	do	— 5.3	0.52	do	Saline, usually dry in late summer	Precariously, conditions rather more favorable than on Kochia land	Yes; after alkali is removed
Kochia (<i>Kochia vestita</i>)	do	— 3.0	0.70	do	Saline usually dry in late summer	Precariously in years of rainfall above the normal	Yes, if alkali can be removed
Greasewood-shadscale (<i>Sarcobatus</i> and <i>Atriplex</i>)	Direct precipitation and high water table	+ 3.0	0.81	Saline or non-saline, usually dry in summer	Saline, moist	No	Yes, after alkali is removed
Grass flat (Salt grass, <i>Distichlis spicata</i>)	Direct precipitation, high water table, springs and irrigation	+ 12.1	0.86	Moderately saline, moist	Moderately saline, moist	Probably not	Possibly, with drainage
Salt flat (<i>Allenrolia occidentalis</i>)	Direct precipitation and high water table	+ 4.2	1.11	Saline, moist	Saline, moist	No	No

(1) Wilting coefficient = the quantity of water as percentage of dry weight remaining in the volume of soil occupied by the active roots of a plant which is beginning to wilt. — All data are given as percentages of the dry weight of the soil.

The shadscale (*Atriplex confertifolia*) association occurs below the Koe belt. The soil is similar, but frequently contains much gravel* and is dry during the summer months. Owing to its greater permeability, irrigated farming would be possible on this land.

The greasewood-shadscale (*Sarcobatus vermiculatus* and *Atriplex confertifolia*) association occurs between the pure shadscale vegetation and salt flats and also on the ridges and knolls intersecting the latter. The vegetation generally contains sufficient available moisture below the first foot during the summer and considerable quantities of alkaline salts. Land of this type is not suitable for dry farming, but can be made to produce good crops with irrigation, especially when drainage is provided.

The presence of the grass-flat (*Sporobolus*, *Distichlis*, *Chrysothamnus*) vegetation indicates a soil with high moisture capacity, moist to the surface during a great part of the year and more or less saline. Such land produces a coarse natural pasturage, but is not suitable for crop-production until drained.

The salt-flat (*Allenrolfea*, *Salicornia*) vegetation occupies land which is extremely saline and wet to the surface during a great part of the year. This type of land is not adapted to crop production.

508 - **The Error in Water Culture Experiments due to the Presence of Trace of Zinc in Glass.** - JAVILLIER, M. in *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, Vol. 158, No. 2, pp. 140-143. Paris, January 12, 1914.

Culture experiments with *Aspergillus niger* in Raulin's solution with and without zinc show different results according to the nature of the vessel employed. Thus:

	Dry weight in grammes.		
	Bohemian Glass (Kavallier)	Jena Glass (Schott and Gen)	Quartz glass
Raulin solution without zinc	0.352	1.861	0.291
" " with zinc	1.780	1.736	1.624

In a solution of hydrochloric acid equivalent in acidity to that of Raulin's solution the writer found 0.05 mgm. of zinc per 125 cc.

509 - **Contribution to the Study of the Formation of Hydrocyanic Acid in Plants** - JORISSEN, A. in *Bulletin de la Classe des Sciences de l'Académie Royale de Belgique*, No. 130-137. Brussels, 1914.

As the result of a number of laboratory experiments, the writer concludes that hydrocyanic acid may be produced in dilute solutions of potassium nitrite and citric acid when the latter is subjected to oxidation by the action of small quantities of iron salts under the influence of light rays. One stage in the transformation would be acetone-dicarboxylic acid ($\text{COOH} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{CH}_2 \cdot \text{COOH}$) which is produced by the action of heat on a mixture of concentrated sulphuric acid and citric acid, or by the action of potassium permanganate on citric acid. Acetone-dicarboxylic acid yields hydrocyanic acid in the presence of dilute solutions of potassium nitrite.

c. - **Note on the Displacement Curves (1) of Organic Bases and their Application to the Determination of the Strength of Alkaloids.** — GOUBAU, R. in *Bulletin de la Classe des Sciences de l'Académie Royale de Belgique*, No. 1, pp. 63-90. Brussels, 1914.

The writer has applied the method of DUTOIT to the determination of certain alkaloids. A known quantity of hydrochloric acid is added to a given quantity of the alkaloid. The solution of the salt thus obtained is diluted with water or alcohol. The conductivity is then determined at constant temperature. A solution of normal or decinormal caustic soda is added, drop by drop, at a time, and the displacement of the alkaloid by each addition of caustic soda is determined by the change in conductivity of the solution. A displacement curve is obtained by plotting the conductivity against the quantity of caustic soda.

The first part of the curve is a straight line corresponding to the neutralisation of the free acid; the second part, corresponding to the hydrolysis of the alkaloid, consists of one or more straight lines according as the alkaloid is mono or polybasic; the third part corresponds to the addition of excess of the soda solution. The angles of the curve are more acute in proportion as the solution is less hydrolysed.

The method has been successfully applied to the following alkaloids: *atropine* in solution in alcohol, even in the presence of small quantities of sugar, gummy matter, etc. *Homatropine* in a solution of equal quantities of water and alcohol, and hydrolysed by normal caustic soda solution. *Scopolamine* in a solution of equal quantities of water and alcohol. The percentage of atropine in pharmaceutical preparations of belladonna can be determined with accuracy by extracting the acid solution with ether or chloroform after removing foreign matter such as resin, chlorophyll, etc. The percentage of *aconitine* in laboratory preparations of aconite can be determined in the same way. *Pilocarpine* and *codeine* are determined in aqueous solutions; *strychnine* in a solution of 5 parts of alcohol to 4 parts of water. These proportions are less reliable for *aconine* (hemlock) and *nicotine* owing to hydrolysis of the salts. The curve for *morphine* (which may act either as a base or an acid) consists of three sections corresponding to the neutralisation of free acid, the displacement of morphine, the formation of sodium morphinate and the addition of free alkali.

- **Methods and Results of the Selection of Flax in Russia.** — ALTHANSEN, L. (Laboratory of Agricultural Chemistry, Central Administration of Agricultural Organisation at St. Petersburg) in *Russisches Journal für experimentelle Landwirtschaft*, Vol. XV, Part 1, pp. 12-47 + 11 plates (German Summary, pp. 48-53). St. Petersburg, 1914.

An account is given of the principles and methods applied to the selection of flax at the Laboratory of Agricultural Chemistry, St. Petersburg. The native varieties of flax consist of mixtures of types affording excellent

(1) See B. Dec. 1912, pp. 2562-2569, original article on « Analysis of wines by a Physico-chemical Volumetric Method » by P. DUBOUX and M. DUTOIT. (E. d.).

material for the selection and separation of strains. Although pure line varieties chosen for some special peculiarity offer distinct advantages, the power of resistance to unfavourable conditions of growth is greater in a variety consisting of a mixture of types. Thus it is possible that certain mixtures of pure lines will give the best results. The isolation of type is comparatively easy, even for the less evident characters, and hybridisation experiments are also being carried out.

In 1913, 601 F_1 generations and 195 F_2 generations had been obtained. The combination and the separation of types is not difficult to observe and does not require much time. Selection is conducted in the laboratory on the results of field observations and determinations of the quality of the fibre.

Great importance is attached to field trials on a large scale. The numerous measurements and the counting necessary are effected with as much economy as possible. Young people who need only read, write and count are employed for the mechanical work, each determination being made by two persons independently. In reducing the necessary measurements to express the character of the type, much calculation and time is saved by using the "individual" mean in place of the arithmetic mean. This method works as follows: the selected plants are arranged in the order of their heights; the centre plant of the series and five neighbours on each side of it are then measured. The arithmetic mean of these plants is considered as the "individual" mean of the series and is sufficiently accurate for practical purposes. The economy of time thus effected enables determination to be made of other characters, such as length of unbranched stem, diameter of stem and the number of seeds.

The selected types are grown in rows between rows of native varieties so that the result of each row can be compared with the results of two rows of a control variety. The accuracy of the trials is increased in the second generation by sowing four rows of each strain from the seed produced in the first generation. The risk of cross-fertilisation in this method is inconsiderable, since self-fertilisation is the rule in flax.

The sowing of the seeds is facilitated by arranging them in the laboratory on strips of perforated cardboard. The strips are the length of the row and the lower side of the perforations is closed by a sheet of thin paper. The seeds therefore rest in small cavities thus formed, about $\frac{1}{2}$ in. apart, and, at planting time, the strips are laid on the soil and the seeds buried by means of a glass rod. This method ensures accuracy and economises time and labour. It is also used for testing the strains on a larger scale, by using larger sheets of cardboard and dispensing with the alternate rows of native varieties. In this case each sheet holds 120 seeds and two such sheets containing different varieties constitute a trial plot. The plots are duplicated from 4 to 8 times.

When sufficient seed has been obtained, the strains are then grown as field cultures and determinations made of the quality of their fibre. This stage has now been reached by varieties which have been under selection since 1909.

On the Appearance of Sterile "Dwarfs" in *Humulus Lupulus* L. — SALMON, E. S. in *Journal of Genetics*, Vol. 3, No. 3, pp. 195-200 + 3 plates. Cambridge, February 1914.

In experiments on hybridising various male and female hops, numerous dwarfs appeared in the F_1 generations. These dwarfs are characterised by very feeble growth the first year, by the subsequent development of numerous shoots prostrate on the surface of the ground or forming an bush-like growth about one foot high, and by the complete absence of flowers even after 7 years' growth. The proportion of sterile dwarfs to normal plants in the F_1 generations varies in different crosses and is greatest in those in which the male hop is a form from Oregon, U. S. A.

A Preliminary Note on the Genetics of *Fragaria*. — RICHARDSON, C. W. in *The Journal of Genetics*, Vol. 3, No. 3, pp. 171-177 + 4 figs + 1 plate. Cambridge, February 1914.

Crosses between *Fragaria vesca semperflorens*, a runner-producing species, and *F. de Gaillon*, a runnerless species, always produce runner-producing plants in F_1 and runner and runnerless plants in F_2 , the runnerless being a marked dominant.

A cross between *F. vesca* having normal trifoliate leaves and *F. mollis* produced normal plants in F_1 , and showed segregation in F_2 , giving 177 normal plants and 73 with single leaves.

Eight garden varieties were selfed and some 1000 plants obtained. These none showed any resemblance to *F. vesca* or to any Alpine species, many showed distinct traces of *F. chinensis*, more of *F. virginiana* and a few of *F. chinensis*. The leaf-character of "Hantbois" occasionally appears in those of French origin.

"St. Antoine de Padoue", a perpetual variety, was selfed and produced a generation consisting of 93 perpetuals, 35 non-perpetuals and 2 sterile ones. Examination of these same plants the following year showed them to consist of 108 perpetuals and 22 non-perpetuals. "Laxton's Perpetual" gave an F_1 generation of 69 perpetuals, 11 non-perpetuals and 2 sterile.

A cross between "Bedford Champion" (non-perpetual) and Laxton's Perpetual gave rise to 24 perpetuals and 53 non-perpetuals, whereas the least expectation would have been equality.

One of these F_1 non-perpetuals gave rise to an F_2 generation consisting of 18 non-perpetuals and 6 perpetuals, and an F_1 perpetual produced 14 perpetuals and 5 perpetuals in F_2 .

The evidence points to the existence of several factors determining the perpetual character.

Experiments on the inheritance of sex were made with female *F. virginiana* and male *F. chiloensis lucida*.

Thus, $F. virginiana \text{ } \text{♀} \times F. chiloensis \text{ } \text{♂} \text{ (1)}$
 $\frac{16 \text{ } \text{♀}}{\text{and } F. virginiana \text{ } \text{♀} \times F. chiloensis lucida \text{ } \text{♂}}$
 $\frac{49 \text{ } \text{♀}}{\text{and } F. virginiana \text{ } \text{♀} \times F. grandiflora \text{ } \text{♀}}$
 $\frac{20 \text{ } \text{♀} \quad 14 \text{ } \text{♀}}{0 \text{ } \text{♂}}$

A cross between *chiloensis* hermaphrodite and *grandiflora* hermaphrodite produced a minority of hermaphrodites, a majority of males and no females, while the cross *virginiana* female and *grandiflora*, mentioned above, produced no males.

It appears that most characters of *Fragaria* are capable of segregating but the occurrence of a certain amount of "linking" may present difficulties requiring many years to solve.

514 - The Farmers' Seed-Growers' Cooperative Association in Wisconsin. MATENAEERS, F. F. in *Deutsche Landwirtschaftliche Presse*, Year XXXI, No. 29, pp. 364. Berlin, April 11, 1914.

The seed-growers' association known under the name of the "Wisconsin Experiment Association" was founded on a cooperative basis in the year 1901 by 187 members. In order to make sure that the members realised the full importance of the objects in view, it was decided that at first only the farmers who had attended a State school of agriculture would be admitted as members.

The expenses of the Association were defrayed by the members or during the first two years. Since 1903 the State has granted a subsidy which last year amounted to about \$ 5000.

The activity of the Association has been considerable from the very beginning. After the secretary of the Association had decided upon the most suitable varieties of seed at the farm of the Experiment Association every member received enough seed for two acres with which to carry out comparative trials. Altogether the experiments are conducted on a large scale; thus for five years 1020 members experimented with barley and 1500 with maize. Already, from the beginning, the members in the various counties were invited to form centres for the supply of selected seeds in their vicinity. In this way 1500 centres for maize were established by the side of those for barley, oats and rye, and their action was such that the neighbouring farms soon adopted the new varieties and thus the desired uniformity in the varieties cultivated was attained, which contributed largely to the present reputation of the Association for maize and other cereals.

The Association has also rendered valuable service in the control of plant diseases.

(1) The signs refer to the sex character of the species as well as to the sex of the parent. (Ed.)

Owing to the considerable growth of the Association, a certain decentralization has become necessary. It has been met by the foundation of local sections for the several counties, which bear the title of "County Orders of the Experiment Association." They are under the supervision of the central management and have a secretary who is appointed and paid by the State Association. When in a county more than fifty farmers sow seeds according to the instructions of the Association, such County Orders are founded. At present there are thirty-eight of them.

For the sale of the selected seed, special packages bearing the trademark of the Association are used. But previously, in the course of the year, the secretary of the County Order must have inspected the methods of selection and other treatment of the seed, and the central Association must have made a final examination of the seed. A special list is kept of the names of the producers of "inspected" seeds.

For the further promotion of the sale of seeds, the State Association has already erected some seed granaries furnished with the necessary appliances.

5. — **Report on the Work of the State Seed-testing Station in Denmark in the Year 1912-13.** — *Communication by the Director, K. DORPH-PETERSEN.*

This seed control station is the oldest in the world; it was founded in 1871 by E. MÖLLER-HOLST and taken over by the State in 1891. The importance which it has gained may be seen from the number of samples examined yearly and which, from 373, the average for the first five years of its existence, has risen to 1,4213 in the year now reported upon. Plant breeders and other farmers and their associations sent 6756 samples for examination in 1912-13.

The seeds are examined as to their quality and place of origin. For the latter the so-called characteristic seeds are looked for. Examinations as to origin are especially frequent for clover seeds and have largely contributed to prevent the importation of undesirable seeds. In the year of the Report, 176 determinations of the place of origin were made.

In the investigation into the purity of the goods, two average samples of at least 1000 seeds each are taken and the following determinations are made: a) content in seeds of the kind which gives its name to the parcel; b) the offal (earth, stones, broken seeds, etc); c) seeds of other cultivated plants; d) seeds of weeds. For the various contents the percentage by weight is given in the examination certificate. In the case of especially noxious weeds their number per kilogram is given also. The Laphanoscope is used for grass seeds that are difficult to examine. If the difference in the proportion of pure seeds in the two average samples is more than 2 per cent., a third determination as to purity is made and an average drawn from the three. A parcel which contains upwards of 15 per cent. of seeds of other cultivated plants is declared to be mixed goods. When the content of weeds and offal is considerably above the usual quantity, the sample is designated as "impure seeds". In 1912-13, 8957 determinations as to purity were made.

For the determination of germination capacity, six lots of one hundred "pure seeds" are placed to germinate in special apparatus. For most small seeds, Jacobsen's or the Copenhagen apparatus is used, as it ensures uniform moisture and allows the temperature to be regulated with precision.

For cereals, pulse and beets the germination capacity is determined after 10 to 12 days, for grasses after 15 to 20. The germination energy is determined after about one-third of the above time.

In 1912-13, 11431 germination tests were carried out, and in 6624 of these the purity and weight of the seeds were also determined. Further, 255 examinations for moisture content were made.

Of the samples examined, 1701 were so-called "second analyses" of seeds which had been delivered to farmers, associations or small traders. Thirteen seedsmen have made an agreement with the Station according to which they must send the latter the addresses of all their clients to whom they have sold guaranteed seeds, and this immediately after delivery. The Station then sends the purchasers instructions for taking samples and a small bag for the same. The examination is charged to the vendor. The results of the examinations are communicated to all the purchasers of the 13 seedsmen and they are also published in the yearly report of the Seed-testing Station. Most of the consignments made during the year have come up to the guarantee. Some of the seedsmen however, have had to pay some compensation under the agreement with the Station.

The examination of seeds sold by traders who had no connexion with the Station showed that nearly one half of the samples did not correspond to the guarantee given with them. Out of the 17 $\frac{1}{2}$ million lbs. of seeds sold in Denmark for grass leys, nearly 12 million lbs. are delivered by the controlled firms. A great proportion of root crop seeds were also tested by the Station.

The present state of seed testing has been brought about without any special legislation or other public measure.

The cost of testing is from 1s 1 $\frac{1}{4}$ d to 7s 8 $\frac{1}{2}$ d per sample. Last year the State granted the Station £200. The rest of its expenses, the whole of which amount to £1925, is covered by the fees.

Impurities in Seeds in Victoria, Australia. — Communicated by the Department of Agriculture.

Report on seed examined in January and February 1914.

Variety of seed	Country of origin	Weed seeds	
		Species	Percentage
clover (<i>Trifolium pratense perenne</i>) .	Germany	<i>Cuscuta</i> sp.	0.39
		<i>Prunella vulgaris</i>	0.05
		<i>Daucus Carota</i>	0.12
clover (<i>Trifolium repens</i>)	Russia	<i>Rumex crispus</i>	1.17
		<i>Rumex Acetosella</i>	5.07
		<i>Spergula arvensis</i>	0.21
grass (<i>Trifolium pratense perenne</i>) . .	Austria	<i>Cuscuta</i> sp.	0.09
		<i>Rumex crispus</i>	0.79
		<i>Carduus lanceolatus</i>	0.02
(Trifolium hybridum).	Russia	<i>Daucus Carota</i>	0.02
		<i>Polygonum Convolvulus</i>	0.02
		<i>Rumex Acetosella</i>	3.61
over (<i>Trifolium pratense perenne</i>) . .	Germany	<i>Cuscuta</i> sp.	0.11
		<i>Daucus Carota</i>	0.02
		<i>Rumex crispus</i>	0.18
ic (<i>Medicago sativa</i>)	Germany	<i>Cuscuta</i> sp.	0.02
ass (<i>Trifolium pratense perenne</i>) . .	Germany	<i>Raphanus</i> sp.	0.22
ass (<i>Trifolium pratense perenne</i>) . .	Germany	<i>Cuscuta</i> sp.	0.12
		<i>Cuscuta</i> sp.	0.14
		<i>Rumex crispus</i>	0.32
Mustard (<i>Sinapis alba</i>)	Germany	<i>Conium maculatum</i>	0.02
		<i>Galium Aparine</i>	1.003
		<i>Polygonum Persicaria</i>	0.09
of pleasure (<i>Camelina sativa</i>) . . .	Germany	<i>Polygonum Convolvulus</i>	0.45
		<i>Conium maculatum</i>	0.07
		<i>Erysimum repandum</i>	1.49
(Lepidium ruderalis)	Germany	—	—
		<i>Cuscuta</i> sp.	0.25
		<i>Chenopodium album</i>	1.15

1, 2 and 4, $\frac{1}{4}$ oz. of seed was examined, in all the others 3 oz. Nos. 2 and 7 were cleaned by division.

and 11 contained a small percentage of grit and lodging (stalks, etc.).
3 and 8 contained also a little *Plantago lanceolata*; No. 4 *Plantago lanceolata*, *Medicago lupulina*; No. 5 *Plantago lanceolata* and *Cichorium Intybus*; No. 6 *Panicum* sp.

- 517 - Investigations on Barley in Connection with the Separation of the Glume through Rapid Drying. — STIMMELMAYER, A. in *Landwirtschaftliche Zeitung*, Year Part 6, pp. 214-216. Stuttgart, March 15, 1914.

The writer carried out at the Seed Selection Station at Weihenstephan Bavaria, a series of experiments on a barley which showed no tendency separate from its glumes, with the object of studying the influence of alternate moistening and rapid drying on the separation of the grain from the glumes.

Four groups of three ears with sound grains were steeped in separate vessels containing spring water at a temperature of 20° C. In the first experiment each lot of ears was steeped and dried for a different length of time at about 45° C., the ears being weighed after each operation in order to determine the average amount of water absorbed.

The result of the first experiment was generally negative; only on a few grains could some cracking of the glumes be observed. The experiment was repeated three times with the same ears. At the third steeping the average weight of the ear after 24 hours' immersion had risen from the normal initial weight of 1.85 grams to 2.62 grams, that is it had absorbed 41.6 per cent. of water; after eight hours' desiccation the average weight of the ear was 1.87 grams. The glumes of 28.2 per cent. of the grains were damaged by the repeated steeping and desiccation, which shows clearly that the alternative wetting and drying undergone by corn during the summer causes the glumes to crack without the intervention of any mechanical action. Repeating the steeping and desiccation a fourth time did not alter the condition of the grain.

To determine the effect of mechanical action, the above ears and others which had not been treated were vigorously rubbed by hand, and the damaged glumes and naked grains were counted. The untreated ears contained 21 per cent. of damaged grains, and of these 0.3 per cent. were quite naked; the treated ears contained 62.4 per cent. of damaged grains, of which 3 per cent. were quite naked. This simple experiment shows clearly that the connection between the grain and the glume is loosened by alternate steeping and drying and becomes apparent when the grain is subjected to rough treatment, as is the case, for instance, in threshing. The loss of glumes in threshing, however, is far less serious to malting barley than the injury that may be caused by threshing in dry years when the grain is brittle and the damage is generally deeper and decreases the germinating power.

- 518 - Analysis of Teosinte Seeds (*Reana luxurians* = *Euchlaena luxurians*, Asch.) (1). — *Renseignements de l'Office Colonial*, Year 8, No. 3, pp. 137-138. Brussels, March 1914.

Chemical analysis of the kernels of this plant shows that it contains more food material than any cereal. The low food value of the seeds as a whole is due to the large percentage (56.37) of pericarp:

(1) See also No. 43, B. Jan. 1911 and No. 1567, B. Aug.-Sept.-Oct. 1911. [54]

	Per cent of fresh kernel	Per cent of dry matter
Humidity (100° C.)	13.46	—
Mineral matter	1.36	1.57
Fat	4.16	4.80
Cellulose (Weende)	1.43	1.65
Total nitrogenous matter	21.25	24.57
Nitrogen-free extract (starch)	53.10	61.38
Pentosans	1.01	1.16
Undetermined	4.23	4.87
Total	100.00	100.00

The high proportions of nitrogenous matter, fat and starch give this a food value of the highest order, as shown by the following figures :

	Food units in 100 parts of dry matter
Teosinte, seeds	135
Wheat flour	156
Flour from teosinte kernels	208.5
Lentil flour	230

The Cultivation of Sulla (*Hedysarum coronarium* L.) in Rice Fields. —

ROZZI, D. in *Il Cultivatore*, Year 60, No. 9, pp. 262-268. Casale Monferrato, March, 1914.

French honeysuckle or Sulla has long been known as a valuable crop for dry land cultivation in hot countries, but it is only within a few years that its suitability for cultivation in rice fields has been proved by experiments in Italy. The advantages of this forage crop are that it requires little cultivation, no special manuring and that it improves the soil by its deep rooting habit; it leaves a considerable amount of stubble behind and yields more forage than any other crop under similar conditions.

Sulla is sown at the rate of about 2.68 lbs. per acre before harvesting the rice, about August 20th. After about a week, germination takes place and when the rice is harvested, small ditches are then cut to facilitate the drainage of the fields and the crop receives no further attention until the following spring, when it is thoroughly weeded. The crop is ready for cutting at the end of July. The residual phosphates of the manuring for the following rice crop are sufficient for the needs of this plant, and its deep rooting habit gives the soil an excellent preparation for the following crop. This crop is therefore most suitable for making the transition from wet to dry land cultivation. The average yields obtained are 2½ cwt. per acre, valued at £3 12s per cwt.

The cost of cultivation and returns per acre are as follows:

Expenses:		£ s d	£ s d
Seed		2 6	
Sowing and opening ditches		8 0	
Weeding		3 3	
Cutting		14 3	
Transport		12 9	
Threshing		1 8 9	
Total			3 9 6
Returns:			
Seed		8 12 9	
Straw		19 3	
Total			9 12 0
Net profit per acre			£ 6 2 6

520 - Cultivation Experiments with *Vicia striata* in Hungary, 1908-11
GYÁRFÁS, J. in *Kísérletiügyi Közlemények*, Vol. XVII, Part 1, pp. 1-11, Budapest, January-February 1914.

Vicia striata, a plant indigenous to Hungary, has long been recommended as a forage crop for alkaline soils, and the Royal Hungarian Experimental Station at Magyaróvár has carried out a long series of experiments with both pot cultures and field trials in cooperation with several agriculturists.

The conclusions arrived at are as follows:

- 1) *Vicia striata* is less resistant to the action of saline salts than *V. sativa* and is consequently unsuitable for alkaline soils.
- 2) As a spring crop on good land it has little agricultural value, growth being inferior to that of *V. sativa*.
- 3) It gives better results as an autumn crop and would probably be useful as a winter forage crop, being as resistant to cold as *V. villosa*.
- 4) Sown in the autumn and harvested as an early crop before the flowering period, i. e. about the end of May or beginning of June, it yields a crop as large as that of *V. villosa*.

The experiments are being continued on a large scale.

521 - On the Coagulation of the Latex of *Manihot Glaziovii*. — MARK, in *Der Pflanser*, Year X, No. 3, pp. 149-157. Daressalam, March 1914.

The writer shows that magnesium sulphate either alone or mixed with other substances is of no practical value. He criticises the use of certain coagulants such as the juices of the citrus and papaw, which introduce impurities difficult to remove by washing and which lower the quality of the rubber.

The experiments carried out at Amani on the use of calcium chloride in combination with other substances are summarised in the following table. The coagulants described as "good" may be used throughout German East Africa except in the coastal regions; those described as "very good" should be used in a solution diluted according to the local climatic conditions, the composition of the water, and the concentration of the latex.

Composition of coagulant %	Coagulation	State of coagulum	Value	Remarks
calcium chloride . . . 0.5 carbolic acid 0.5	poor	thick filaments with large nodules	none	
calcium chloride . . . 0.5 acetic acid 0.5	good	thick narrow strips	useful	
calcium chloride . . . 0.5 carbolic acid 0.3 acetic acid 0.15	poor	like No. 2.	useful in some cases	For use only on dry plantations
calcium chloride . . . 0.75 acetic acid 0.75	very good	thick and narrow strands	useful	
calcium chloride . . . 1.0 carbolic acid 0.25	poor	narrow threads	useful in some cases	
calcium chloride . . . 1.0 carbolic acid 0.3 acetic acid 0.15	good	like No. 2.	useful	
calcium chloride . . . 1.0 carbolic acid 0.5	good	like No. 4.	useful	Too weak for young trees and wet districts
calcium chloride . . . 1.0 acetic acid 1.0	very good	like No. 4.	useful	
calcium chloride . . . 1.0 acetic acid 0.25	good	thick narrow strips well coagulated	useful	
calcium chloride . . . 1.25 acetic acid 0.5	good	like No. 9.	useful	
calcium chloride . . . 1.25 carbolic acid 0.5	good	like No. 9.	useful	
calcium chloride . . . 1.25 carbolic acid 0.75	very good	like No. 9.	useful	
calcium chloride . . . 1.5 carbolic acid 0.25	very good	like No. 9.	useful	
calcium chloride . . . 1.5 acetic acid 0.5	good	like No. 4.	useful	
calcium chloride . . . 1.5 carbolic acid 0.5	very good	like No. 9.	useful	
calcium chloride . . . 1.5 acetic acid 1.0	very good	thick narrow strips easily separable	useful	Too strong for hot dry districts
calcium chloride . . . 1.5 acetic acid 0.25 carbolic acid 0.25	very good	like No. 16.	useful	

- 522 - **The Coagulation of the Latex of *Hevea brasiliensis*, and its bearing on the Strength of Rubber.** — BARRETT, N. W. in *The Journal of the Society of Chemical Industry*, Vol. XXXIII, No. 6, pp. 289-293 + 4 figs. London, March 31, 1914.

Experiments on the behaviour of latex in solutions of varying concentration of acids and salts show that the coagulation of latex is analogous to the coagulation of protein solutions. Thus the coagulating effect of salts varies according to the basic radicle in the order of Hofmeister's series. Mineral acids up to a certain concentration increase the quantity of salt required to effect coagulation, but at higher concentrations less salt is required. With organic acids no limiting concentration was found above which coagulation took place without increase in concentration of salt.

Since the physical properties of proteins depend upon the concentrations of salt and acid with which they are in equilibrium, it seems very probable that the physical properties of plantation rubber are dependent on the concentration of the salts and acids in the latex at the time of coagulation. Thus, the addition of water and dilute acid would appear to be the cause of the variability and inferiority of plantation rubber compared with Fine Hard Para prepared by the Amazonian smoking method. The adoption of uniform methods of coagulation by acid on estates would not remove the variability of the product, owing to the natural variation in the composition of latex due to genetic and physiological differences in the trees and the influence of climatic variations.

The standardisation of plantation rubber, therefore, becomes exceedingly difficult and involves testing the product of each individual coagulating vessel.

- 523 - **Precautions for the Growing and Transplanting of Liberian Coffee.** — FAUCHÈRE, A. in *L'Agriculture pratique des pays chauds*, Year 14, No. 131, pp. 81-8; Paris, February 1914.

The slow growth and late maturity of the Liberian coffee is attributed to the lack of care in the preparation of the nurseries and the transplanting of the young plants. By observing the following precautions the tree may come into bearing 18 months earlier.

Nurseries. — In order to be able to lift the plant with a ball of soil the seeds should be sown in a clay soil at least 10 in. apart each way. There should be a nursery for each 25 acres of land, so as to avoid excessive transport, and each nursery should contain twice the number of plants required so as to allow for a careful selection.

Transplanting. — A plant 14 inches high should be lifted with a ball of soil 8 inches deep and 5 inches in diameter. Neglect of these conditions delays maturity from 1 to 2 years and endangers the life of the plants.

- 524 - **"Autumnal Flavour" of Tea.** — *The Indian Agriculturist*, Vol. 39, No. 3, pp. 71-72; Calcutta, March 2, 1914.

At the beginning of the cold season in the north of India the leaves of the tea plant undergo a change which gives the tea a very special aroma known as "autumnal flavour" and the leaves require a different treatment

... that during the rest of the year. The following method is the outcome of many years' experience.

The leaves are brought to the factory three times a day, at 12.30, and 4.30 p. m., and are kept in a fresh state until 10 p. m. They are then rolled for half an hour, sifted and rolled again. Fermentation is allowed to take place during the night, and in the early morning the leaves are rolled again and dried. The whole process occupies only 10 hours. The increased expenses of the night labour are compensated for by the higher value of the product thus obtained.

Recognition of Tanning and Colouring Matters by Means of the "Mulhouse Band". — BERTEAU, A. in *L'Agronomie coloniale*, Year I, No. 9, pp. 65-79. Paris, March 1914.

A simple process for the detection of tanning materials and dyes has been investigated by the "Jardin Colonial" of Nogent-sur-Marne. It consists in the use of the "Mulhouse band"; this is a piece of cloth 8 inches wide, divided into five zones treated with different mordants, with a small untreated piece between every two zones. The mordants are: 1) strong iron salts, 2) weak iron salts, 3) half iron, half alumina, 4) weak alumina salts, and 5) strong alumina salts.

Tannins, precipitating iron salts, show up specially on the first zones, which become tinted with some colour between black and brown or green; true colouring matters show on the alumina zones.

The Mulhouse band is put into boiling water containing some of the substance to be examined; another band is treated in the same way, but using a standard tanning or colouring material. If, on comparing these two bands, it is found that the substance seems to contain valuable materials, it should be sent to some laboratory for proper analysis.

Problems Concerning the Utilisation of the Dum Palm in Italian Erythrea. — BALDRATI, I. in *L'Agricoltura Coloniale*, Year 8, Nos. 2 and 3, pp. 85-107 and 182-200, + 4 figs. Florence, February and March 1914.

The exportation of the fruits of the dum palm (*Hyphaene*) from Italian Erythrea only attained any importance towards 1906, since when production has been rapid, as is seen from the following figures:

Year	1907	1908	1909	1910	1911	1912	1913 (10 months)
Exports in tons	332	1693	485	3204	3832	3726	3655

Two types of fruit are distinguishable: 1) Oval in shape, with smooth face; 2) elongated and irregular in shape, with protuberances. The second type has larger fruits and nuts with flat faces and is superior in industrial value. Each type includes two varieties: one with sweet fruits of a deeper colour and heavier, the other with bitter fruits almost without pulp but more suitable for producing vegetable ivory.

The dum palm groves in Erythrea are only of recent formation and are extending rapidly. The spread of this palm is effected by means of cuttings; the entire fruits are consumed and the kernels germinate after

passing through the animals. The spread has also been promoted by the periodical emigrations of the Beni Amer tribes.

It has been feared that the exportation of the fruits would interfere with the natural reproduction of this palm, but the writer points out that such fears are groundless considering the importance of propagation by means of suckers; groups of palms of the same sex and derived from one plant are frequently found in the forests, and propagation by means of suckers is preferred in the formation of new plantations.

Since one male tree is sufficient to pollinate ten female trees, it is important to be able to identify the sex of a tree before flowering. According to GRANT and BECCARI the males are recognised by the foliage covering the trunk, whilst the females have bare trunks. The writer finds this not to be the case, and distinguishes the sexes according to the size of the leaves and number of segments as follows:

	Male inches	Female inches
Leaf blade	47-51	58-70
Petiole	39-47	47-62
No. of segments . . .	71-79	80-86
	(always odd)	(always even)

At a distance, the leaves of the female trees may be recognised by the numerous leaflets and the incurving of the lower part.

Regular and abundant rainfall produces an abundance of flowers; a good yield appears to be dependent on the wind. As a rule good and bad harvests alternate:

1907 harvest very poor	1911	harvest poor
1908 " very good	1912	" good
1909 " good	1913	" medium.
1910 " very good.		

The exact age at which this palm begins to fruit is not known, but the writer considers it is two or three years later than in the case of the date palm. Although often cited as a xerophyllous plant, this palm is often found in luxuriant growth in deep alluvial soils periodically inundated. The plantations require protection against the ravages of fire, monkeys, parrots and the natives.

The yield varies from 4600 to 7600 lbs. per acre, of 40 to 50 female trees. If the number of male trees were reduced to one for every ten females, the number of female trees would be increased to from 70 to 100 per acre and the yield increased to an average of 13000 lbs., corresponding to 4600 lb of kernels.

The cost of the nuts at Genoa amounts to £7 to £9 per ton.

The writer concludes by an account of the different uses of the date palm and the improvements to be made in its utilization.

17 - **Field Cultivation of Capsicum in Meglena, Hellenic Macedonia.** — Communication from PANAYOTIS A. DEGAZOS, Chief of the Department of Agriculture of Macedonia (Salonica).

Capsicum powder, or "red pepper", is used throughout the Balkan countries (Turkey, Roumania, Bulgaria, Servia) and in Hungary, especially by the agricultural population, as a condiment in the preparation of food. The most esteemed products of capsicum are those with the "hottest" flavour; these are produced almost exclusively in Meglena (Turkish, Karagova), Hellenic Macedonia, in which valley this cultivation predominates and is so extensive as to be considered an agricultural rather than a horticultural industry.

The fertile soils of this valley are derived chiefly from argillaceous schists and limestones and are loamy or sandy with considerable percentages of lime and organic matter. The majority of this land is irrigable from the 15 small streams which flow through it.

The climate is Mediterranean (1) and warmer during the winter than that of Monastir and Norina in the same latitude, owing to the surrounding mountains (2) which shelter it from the cold north and north-east winds, while the summer temperature remains cool owing to the currents of cold air from these same mountains. The atmosphere is very moist throughout the year, owing to the abundant rainfall and numerous streams.

The population of Meglena is about 125 per square mile and is ample supply the labour requirements of this crop.

Rotations. — Capsicum follows maize or French beans in either the two following rotations:

wheat	wheat
maize	maize
capsicum	French beans
	capsicum.

(1) The climatic conditions of Meglena are probably between those of Salonica and Monastir, which, according to DURUY (Monastir 1899-1903) and to some observations of the Agricultural College at Salonica (1906-1910) are as follows:

Month.	Temperature, °C.		Rainfall in mm.	
	Salonica	Monastir	Salonica	Monastir
July	20.56	17	43.6	68.0
August	24.20	19	16.1	71.0
September	25.23	23	29.0	49.0
October	24.21	22	38.0	40.0
November	17.50	18	37.0	29.0

(2) For an account of the geological and physical conditions, see CYRIL, *Geographie et Géologie von Mazedonien und Albanien*. — *Petermanns Mitteilungen, Ergänzungsheft* No. 162, p. 224 et seq. (Morichovo und Meglen). Gotha, 1908.

A three- or four-course rotation is necessary to maintain the fertility for this crop, and to check the progress of underground pests. On account of the large amount of labour required, it is a suitable crop for the small holder and for countries where labour is cheap and plentiful.

Cultivated varieties.—During the half century in which this crop has been grown on a large scale in Meglena, many varieties have originated and become adapted to the particular conditions of climate and soil in which they are grown. Each variety yields a product of special type of more or less good quality, varying according to the locality. Experiments have shown that these Meglena varieties lose a considerable part of their quality and piquancy when grown in other countries or even in neighbouring districts. The Grecian occupation being very recent, it has not been possible to study the relative conditions from the scientific point of view. It is only known that the products of highest quality come from the villages of Neochore, Fressino, Poziar and Stroúpino.

Two of these varieties are distinguished as common and sweet capsicum respectively.

Common capsicum is of commercial importance and is preferred by the cultivators on account of its higher yield. The fruits are very conic in shape with a length of $2\frac{1}{2}$ to 4 inches, and a diameter at the base $\frac{3}{4}$ to $1\frac{1}{2}$ inch. The skin is rather thick, and 4 to 8 lbs. of fruit, according to the moisture content, are required to yield 1 lb. of pepper. This variety grows to height of 16 to 24 inches, and each plant produces only 40 to 50 fruits, owing to the reduction in irrigation during the season. The annual production of common capsicum reaches 2 to 4 million lbs. and increases each year.

Sweet capsicum.—The fruits of this variety are almost as large as those of the above, but the skin is thinner and the product is both piquant and sweet. It is cultivated only in the villages of Bakovo, Csernezi and Stroúpino. At least 8 lbs. of dry fruits are required to produce 1 lb. of pepper, and although it realises higher prices in the market, it is a less profitable crop to cultivate than the common capsicum. The annual production reaches only 10 000 to 20 000 lbs. of pepper. Experiments have shown that the seeds of this variety grown in other villages produce plants with the characteristics of the common variety.

Preparation of nurseries.—The seeds are not generally sown in the open but in a cold pit, and afterwards transplanted. A sheltered plot is chosen and dug to a depth of 12 to 20 inches at the beginning of April. The surface soil is mixed with well decomposed manure and the seeds sown thickly towards the end of April. A thin layer of finely divided manure is then spread over the surface and the bed watered each evening until the majority of the plants have appeared. Later, waterings are given every 5 or 6 days according to the weather. Two days before transplanting they are given a thorough watering to facilitate the lifting of the plants. The seedlings are kept hoed and thinned to promote strong growth, and if at the time of transplanting they appear backward, a dressing of pigeon guano is given in the seed-bed.

Preparation of the land and planting out. — The best soils for capsicum are loams or sands containing humus, and capable of irrigation. The land is ploughed, and then harrowed five or six times to reduce it to as fine a texture as possible. It is then ridged and the irrigation channels cleaned out. Planting out takes place during June, when the plants possess 4 or 5 leaves. The soil is irrigated and the plants are dibbled by hand in holes 8 or 10 inches apart on the ridges, which are 16 inches apart.

Irrigation and weeding. — After transplanting, the soil is irrigated every 3 or 5 days until the success of the plants is assured. The first weeding takes place a fortnight after the last irrigation, unless weeds are much in evidence before this time. When the plants are established, irrigation is withheld until the leaves show signs of drought. This point is of considerable importance, since irrigation at this stage may greatly injure the quality of the product, the piquancy being partially or wholly destroyed. Three or four days after this second irrigation the land is hoed again deeply and the plants earthed up. The next irrigation is made after the capsules have begun to swell and before the plants appear as wilted as for the previous irrigation. If necessary, a final weeding is made, and then the plants are irrigated every 4 or 5 days.

Harvest and drying of the fruits. — The capsules are harvested during September and early October when they have assumed a dark red colour and when nearly all their moisture has evaporated. The ripening of the fruits takes place at intervals, and the harvest is generally divided into three periods according to the stage of ripening. In some villages with a warmer climate, where the autumn frosts come later, the crop is often picked at one time at the beginning of October, when the majority of the fruits are very ripe and have acquired a better colour and a higher market value.

The fruits from the first picking may be dried in the sun if conditions are favourable, but generally they are dried in a special drying shed, containing a perforated wooden platform fixed at 55 to 60 inches from the floor. The capsules are dried on this in a layer not more than 20 to 24 inches thick, lest the colour and quality of the product should be damaged. To avoid risk of fire in houses, special drying sheds are generally used. If open fires are used, the smoke of which develops the colour of the product, the drying process lasts from 7 to 17 days, and with slow drying at relatively low temperatures a finer product is obtained. The drying is said to be complete when the fruits are very fragile, and crackle. In order to completely dry the fruits, including the thick placenta, they are covered over with paper, the temperature is raised for 48 hours. They are then collected, broken into small fragments by means of a stick and taken to the flour mill, where they are ground on a soft millstone.

Yield and returns. Control of purity. — The average yield of red pepper is from 1300 to 2200 lbs. per acre; from 5 to 8 lbs. of capsules are required to produce 1 lb. of common capsicum and from 8 to 10 lbs. for each lb. of sweet capsicum. Sometimes the broken dried fruits are sold under the name of "boucovo". The price of the powder fluctuates between

2 $\frac{1}{4}$ d and 4 $\frac{1}{2}$ d per lb. The largest market is Edessa (Vodena) in Hellenic Macedonia, where it is sold in bags of 100 kg. (220 lbs.).

The best quality of red pepper has a bright rose-red colour, the dark red and reddish-green varieties being the inferior grades. The bright red colour is obtained by sun-drying or by slow continuous drying. If the fruits have been touched by frost before picking, they develop a greenish colour and lose their piquancy. Attempts to improve the appearance of the inferior grades by chemical treatment, have been prevented by the action of the Turkish Government during the last ten years. Before export the product is inspected at a central depot where a small sample is taken from each bag and tested for colouring matter by making an alcoholic extract and evaporating a little on a sheet of clean cigarette paper. Any chemical treatment of the product shows itself in different coloured stains on the paper, while the pure pepper gives a uniform pale red. Adulterated products are confiscated and destroyed, and the bags which are certified as pure are specially sealed to avoid their being opened before reaching their destination.

The cost of growing capsicum, including the drying, is £9 10s. 1d. per acre, while the gross returns are from £13 to £17 10s.

528 - **Warm Baths for Forcing Strawberries.** — BALTEL, G. in *Revue Hortica* Year 86, No. 9, p. 212, Paris, May 1914.

Young plants are obtained by rooting runners in small pots early in June and then planting out in the open. They are repotted in September and sheltered when necessary. Before forcing in November or December a small pad of straw or hay is placed round the neck of the plant and tied on so as to prevent loss of soil when the pot is inverted. The pots are then inverted on an iron grid over a tank of water at a temperature of 32 to 35° C. (89° to 95° F.) so that the leaves are submerged. After treatment in this way for from 6 to 8 hours, the plants grow more rapidly, produce more flowers and give a better yield of fruit.

529 - **Recent Work of the Royal Hungarian Central Ampelological Institute, Budapest.** — Communication from DR. GYULA DE ISTVÁNYFI, Professor at the University and Director of the Institute.

1). *Research on mildew in vines.* — Experiments have been conducted for more than 10 years; a new line was taken up in 1911 with the institution of infection experiments. A summary has been published in Hungarian, of which a French translation appeared in the *Annales de l'Institut ampéologique* (1). The chief results have already been published in the *Bulletin of Agricultural Intelligence and Plant Diseases* (2).

2). *Researches on the relation between climatic conditions and mildew.* These have been completed after five years' work, and indicate the meteorological conditions favourable to the development of mildew, the course

(1) GY. DE ISTVÁNYFI and GY. PALINKÁS: Etudes sur le Mildiou de la Vigne. Vol. II 1913, June, pp. 1-122, pl. I-IX. Budapest, 1912.

(2) See No. 1208, B. Oct. 1913.

(Ed.).

the propagation of the disease during several years and the means of preventing outbreaks (1).

3). *The Intelligence Department for reporting the spread of mildew.* — Established in 1911 on the initiative of the Director of the Institute. Data collected with the assistance of diseased specimens sent to the Institute. Reports are published weekly in the papers indicating the districts where climatic conditions are favourable to the outbreak of the disease. This work has made the Institute popular and considerably strengthened its work.

4). *Information relating to defensive measures* (with coloured illustrations). These appeared in 1912 in new publications; of the articles relating to the control of mildew 12 000 copies were distributed in 5 700 wine-growing districts.

5). *Experiments in the control of mildew.* — The agricultural value of various remedies used in various countries was determined in two series of experiments carried out in 8 and 10 State vineyards respectively. The Institute undertakes the testing of all acceptable remedies during a period of three years under the most varied climatic conditions.

6). The origin of "bramble-leaf", frozen stocks, the preparation of them, their treatment and preservation from a mycological point of view, have been studied. The publication of this work was completed in 1913.

7). *Researches on the degeneration of vineyards in certain districts.* — Considerable work was done during 1912-13, especially in the sandy vineyards of the Alföld. The subject was studied from the point of view of anatomy, biology, pathology, meteorology and pedology. The chief causes of the degeneration are drought, frost, exhaustion of the vines, insect, and damage due to attacks of cockchafer grubs and phylloxera. Good results have been obtained in the experiments in the mountain districts Tokay-Hegyálja and at Somlyóhegy. A collection of phytopathological studies is in course of preparation, together with an account of the methods of examination used by the Institute.

8). *The control and examination of the means of destruction* is one of the most important works of the Institute, and deals with all the remedies in use. In 1912, 103 specimens were examined and 360 determinations made. The biological and phytopathological effect of new remedies is seriously tested on vines under glass before experimenting in vineyards. Experiments have also been made on the use of carbon tetrachloride against phylloxera in four vineyards. Spraying materials have been tried in vineyards. In 1912, 142 determinations were made, and the value of the "Tempus" spray was also determined in the experiment fields of the Institute at Óbuda.

9). *Studies on defects of wines* are in course of publication. They relate to: a) the examination of acetification of wines, brought about by 26 different acetifying bacteria; the best varieties for the production of vine-

(1) See No. 68, B. Jan. 1913.

gar were chosen; b) detailed researches on lactic fermentation, which according to results obtained at the Institute, is the cause of numerous defects of wine; c) the examination of the organisms of must, showing that the organisms causing the diseases of wine are already present in the must; this led to an examination of the sulphuring process and the fermentation of the must by yeast; d) the study of the flavour of Hungarian wines known as "levegő íz" (air flavour), which has shown that yeasts play an important part in producing substances which influence the flavour and aroma of wines.

10). *The practical application of yeast cultures.*—After studying in detail the action of the various yeasts in the chief vine-growing district the Institute placed these yeasts at the disposal of wine-makers in 1911 and 1913. The yeasts included: 1) those producing a high alcoholic content, for "Aszu" wine; 2) organisms giving a good fermentation even at low temperatures; 3) organisms settling to the bottom of the liquid and suitable for champagnes; 4) organisms capable of fermenting must containing a considerable quantity of sulphurous acid; 5) highly resistant organisms; 6) organisms which rapidly form a thick scum when alcoholic fermentation is complete; 7) organisms for fermenting red wines. Some 45 000 gallons of must were fermented, and in the majority of cases better wines with higher prices were obtained. In the autumn of 1913 this procedure was continued on a larger scale. As the result of experiment it was found that the best condition for despatching the yeasts was absorbed in sterilised cotton wool, in which condition they retained their vitality after 4 or 5 months.

A description of the properties of the 54 varieties of ferments so far selected, and a determination of the maximum quantity of alcohol produced in musts of different concentrations of sugar, are in course of progress.

11). *Experiments in vine-growing* are being carried out in State vineyards in different districts, with the object of determining the most suitable time for pruning; these experiments will be terminated in 1915 after six years' duration. At the same time the composition of the bleeding sap is determined by chemical analyses (34 in 1912). Hengli's new grafting machine was also tried from the point of view of perfecting the work, and as a result of the anatomical examination of the joint and the graft it was concluded that this machine could not efficiently replace hand grafting on a large scale.

12). *Manurial experiments* to compare the value of different excreta have been carried out since 1909. In 1912 additional experiments were begun, comprising 360 chemical analyses of 86 samples of must. Further analyses have been made of the fertilising value of grape pomace, tobacco refuse, brewers' hops, sawdust, etc. Experiments with chemical manure in 1912 were designed to establish the most suitable mixtures for large areas of soil types; these experiments are being conducted at present in 7 districts.

13). Experiments with different types of stakes have been made.

14). Smudging against frost has been tried in four State vineyards.

15). *Experiments with hybrid stocks.* — Nine experiment fields were started in 1912 in various localities of Hungary, and others are contemplated. Tree nurseries have been established in different districts for the propagation of stocks. Observations have been made of 70 plantations of hybrids in 12 different counties, with respect to the suitability of hybrids under certain conditions of soil, particular attention being paid to the difficulties of treating the soil with carbon disulphide. Various binding materials, such as raphia, bast and jute, have also been tried.

16). *The Hungarian Ampelography*, describing all the more important varieties, with colour-photographs, is nearing completion.

17). *Publications.* — The *Annuaire* has been discontinued, and popular articles are published in *Borszati Lapok*. Vol. IV. of the *Annals* containing only technical articles has appeared, and the French edition will be out.

18). *Vine-growing and meteorological stations.* — There are 11 of these work under the Institute; the results given by them, especially as to dew, have been very useful. Their climatological data for 1901-08 were recently been published under the title of *Réthy Antal* (142 pp.).

19). *Observations on the development and phenology of the vine* were carried on by means of schedules in 1912; the observations now extend to twelve years.

20). *Ampelographical Collection.* — This is situated at Kőbánya, near Budapest; it contains 600 varieties. The Institute also possesses a vineyard at Orsova, far from any vine district, where imported varieties are raised; these are then used for hybridization, chiefly to obtain adaptable ones.

21). The information department replied, in 1912, to 3385 enquiries in all branches of vine-growing and wine-making.

— **The Growth of the Roots of the Vine and its Importance in the Manuring and Cultivation of the Soil of Vineyards.** — KROEMER in *Zeitschrift für Weinbau und Weinbehandlung*, Year 1, Parts 1 and 2, pp. 37-46 and 70-81. Berlin, 1914.

The writer describes the development of the root-system of the vine, particularly the active portion, and its relation to the physical properties of the soil. He concludes that the most favourable conditions for the development of the active root system occur in the upper layer of soil in that the deeper root system is concerned with the absorption of water rather than food material, though the more soluble constituents, such as nitrogenous ones for example, may also be absorbed by these deep roots.

Consequently the removal of superficial roots as generally carried out is injurious to the plants, and appropriate cultural methods ought to be employed instead which would encourage the development of surface roots in addition to the deeper root system.

For the first few years after planting the soil should be cultivated deeply while the deep root system develops. In older vineyards on fairly rich soil the superficial root system can then be stimulated without danger to the plants, and care should be taken not to disturb the surface soil.

by carrying out only very shallow tillages. The same treatment may be adopted in the case of soils with a high water-table. On the other hand, in light, permeable dry soils with a low water-table, and especially in districts of low rainfall, deep cultivation should still be practised to develop a deep penetrating root system.

531 - **Protection of Vines against Spring Frost.** — LUR-SALUCES in *Bulletin de la Société des Agriculteurs de France*, Year 16, pp. 265-267. Paris, April 15, 1914.

A system of protection against spring frosts was organised in the district of Sauternes (Gironde) in 1913, with good results. The land of each commune was divided into a number of sections; in each commune one of the growers volunteered to give the alarm: he fires a cannon at night if a frost seems likely, then three shots when the fires are to be lit, and three more in the morning when the temperature rises above freezing-point.

Fire places are fixed in the alleys of each section at intervals of 30 yds., and besides them one cauldron on wheels is supplied for every 12 acres or so; this moves up and down in a cross shape. The cauldron is half full of coal tar, which is lit by means of pine branches; it is occasionally sprinkled with water to increase the denseness of the smoke. The fixed fires are made of green pine branches, litter, green grass, etc. In this means a very dense smoke was obtained, so that it was difficult to find one's way about; this completely prevented further radiation from the ground. In case there is much current of air, it is well to have extra cauldrons producing smoke on the windward side.

At Preignac, in 1913, the cost of smudging on three mornings in April for about 5 hrs. each was about 3s 6d per acre for materials alone.

532 - **The World's Trade in Bananas.** — MACFARLANE, JOHN I. in *The Tea and Coffee Trade Journal*, Vol. XXVI, No. 3, pp. 226-230 + 6 figs. New York, March 1914.

I. — **Importing countries.** — *United States.* This country is the world's greatest consumer of bananas. During the fiscal year ending June 30, 1913, \$ 28 657 084 worth of fruit were imported, more than half of which consisted of bananas. The latter were imported chiefly from the regions bordering the Caribbean Sea, as shown in the following table:

Imports of Bananas to the United States, 1912-13.

	No. of bunches	Value — \$
Jamaica	11 163 269	3 488 498
Honduras	7 983 591	2 435 006
Costa Rica	6 973 684	2 744 813
Panama	4 438 300	2 082 502
Guatemala	2 359 250	600 041
Colombia	2 684 749	1 107 429
Cuba	2 213 733	834 206
Nicaragua	1 681 944	348 064
Mexico	1 541 504	412 315
British Honduras	651 054	163 249
S. Domingo	475 500	222 626
Guiana	184 498	39 932
Grenada	4 398	4 111
Other regions of the West Indies	1 625	466
Total	42 357 109	14 484 258

Half of the bananas imported to the United States enter through the port of New Orleans, which receives more bananas than any other port in the world and possesses special facilities for landing the fruits. The value of the bananas imported to Europe is almost equal to that of the United States, but the quantity is only about one-third. England, France and Germany are the most important consumers in Europe. England is second to the United States in imports of bananas, and these are increasing rapidly.

	No. of bunches	Value — \$
1900.	1 287 000	2 740 000
1912.	6 978 876	9 587 000

Germany imports 35 226 000 kg., valued at \$2 525 000, while France imported 21 749 000 kg., valued at \$1 219 000.

II. *Exporting Countries*.—Jamaica comes first in the exportation of bananas:

1911.	16 947 385 bunches
1912.	13 382 072 "

The decrease in 1912 is attributed to accidental causes.

Costa Rica comes second, with an export of 10 647 000 bunches, and with an increasing production.

Honduras is rapidly increasing her exports to the United States, and Panama has doubled her exports during the last ten years.

The Canary Is., which were formerly the chief exporters to Europe, maintain their exports at about 2 723 000 bunches.

— *Citropsis*, a New Tropical African Genus allied to *Citrus*. — SWINGLE, WALTER and KELLERMAN, MAUDE in *Journal of Agricultural Research*, Vol. I, No. 5, pp. 420-436 + 7 figs. + 1 plate. Washington, February 1914.

The fruits of *Citropsis* are known as "African cherry oranges"; they are produced in clusters from the axils of the leaves. The writers considered it necessary to establish a new genus to include these African species, and they do this by raising the section *Citropsis* of Engler to generic rank. The following species are described: *C. Preussii* (Engler), *C. Schweinfurthii* (Engler), *C. gabunensis* (Engler) and *C. mirabilis* (Chev.), as well as *articulata* (Willd.) which is not well known.

The members of this genus are worthy of the attention of agriculturists, as several of them produce an abundance of delicious fruits. *C. Schweinfurthii* has given good results on poor sandy soils in Florida. It is expected that the numerous small fruits may be increased in size by hybridization with *Citrus*; successful crosses have already been obtained.

LIVE STOCK AND BREEDING.

- 534 - **Research on the Life History of the Large Warble Fly (1) and Means Controlling It.** — LUCET, ADRIEN in *Comptes Rendus Hebdomadaires des Séances l'Académie des Sciences*, Vol. 158, No. 13, pp. 968-970. Paris, March 30, 1914.

The writer communicates further investigations into the life history of the large warble fly. The adult fly lives only until it has mated and deposited its eggs.

In eleven flies, observed by the writer, the average duration of life was from four to five days. During this time the fly does not seem to take food. It does not appear either to travel any distance from the place where it was hatched, flying only in fine, warm weather, and not moving in the evenings, evenings or cool wet weather. The number of eggs which were found in the bodies of four females were: 372, 386, 357 and 343, which is less than the number found by GLÄSER. Recently-laid eggs contained the larvae already clearly formed.

Neither placing adult flies on the neck and back of an ox nor enclosing the ox with some flies in a cage for several days appeared to alarm the animal, from which the writer is led to believe that the gadding of cat is not caused by warble flies.

The writer also undertook experiments for the control of warbles and obtained very satisfactory results with tincture of iodine prepared according to the pharmacopoea. An injection of 0.5 and 1 cc. of pure or diluted tincture of iodine (Gram solution) practised on the swellings of two oxen had the result of killing all of the *St. larvæ* they contained. These experiments were to be continued in May in the Département of Ariège.

- 535 - **Practical Observations on Contagion in Anthrax of Cattle, on the Distribution of Cases by Vaccination and on Uniform Immunization.** — VÁRDI in *Allatorvosi Lapok*, XXXVI, No. 30, pp. 355-358. Budapest, 1913.

The writer reports on his results obtained from the dissection of 12 cattle and from the clinical observation of about 250 diseased ones. Contrary to the generally accepted opinion, according to which the food is credited with being the chief source of contagion, the writer believes that at least 80 per cent. of the cases are due to the drinking water. In support of this opinion he mentions instances of large estates and communes in which only the animals that drank the water from certain sources fell ill and the disease disappeared as soon as these sources were closed. Infection through wounds in the skin is possible, but it is so rare that it can be practically neglected. Where, on the contrary, infected water exists, the disease may attack stall-fed animals also, and exceptionally even buffaloes.

As for the age, it has been observed that in such localities not only steers contract the disease, but also calves immediately after weaning, and this so frequently that they must be regularly vaccinated at that time. In one

(1) See No. 144, *B. Feb.* 1913; No. 251, *B. March* 1914; No. 445, *B. May* 1914.

avoid cases of sickness due to the inoculation, it is recommended to grind fine the powdered matter used for vaccinating, as by this means it can be more exactly dosed. Only the matter obtained from the liquid retained in the swellings is suitable for this purpose, as that obtained from the muscles cannot be reduced to a uniform powder.

Observing this method, 5000 head of cattle have been inoculated in the course of eight years without any losses, and only in the ninth year two deaths occur shortly after inoculation.

For the treatment of diseased animals intravenous injection of hydrogen peroxide, followed by the incision and washing out of the swellings, is recommended. As a prophylactic measure immediately on the outbreak of the disease, a search should be made for infected wells or other sources of water.

Swine-pox in Young Pigs. — BÄN, E., in *Allatorvosi Lapok*, Year XXXVI, No. 52, pp. 620-621. Budapest, December 27, 1913.

The existence of swine-pox was until recently considered doubtful. Chauveau, Gerlach and R. Koch had, however, demonstrated that cow-pox can be artificially communicated to pigs, but under natural conditions the disease had hardly ever been observed. In 1906 Száutó proved that pigs, especially sucking ones, sometimes contract the disease and that they communicate it to healthy animals by merely living with them. Since then, from year to year the number of observations has increased and it appears that in many districts of Hungary the disease is fairly frequent, that it attacks the herds every year and that sometimes it causes considerable losses. This is especially true of districts on the right bank of the Danube, where, according to the writer's observations, it is one of the most frequent diseases of sucking pigs. Generally it develops so insidiously that the owner is only aware of its presence when a proportion of the weaned pigs are arrested in their development or some of them die. When the herds are once infected it is very difficult, as with cow-pox, to free them again, even making use of repeated disinfections.

The disease is accompanied by severe itching, which leads to the production of an eczema. The course of the attack is generally mild, but sometimes serious losses occur, mostly through complication with intestinal or chronic catarrhal pneumonia. In one herd the necrosis of the lungs was observed, but it is not certain that this complication was caused directly by the disease. Protective inoculations with cow-pox lymph give good results in several localities on about 400 young pigs. Small nodules were formed at the place of inoculation, but otherwise the animals' health was in no wise impaired. In one case, a few pigs developed small nodules on the inner side of the thigh, where they had been inoculated, and after 6 or 8 weeks all the other animals fell ill, but not seriously. It is not impossible that these inoculations, which of late have been more frequently practised, may have contributed to the spread of the disease.

- 537 - **Causes and Effects of Cryptorchism.** — ZSÁMÁR, GEORGE in *Magyarországi Orvosi Lapok*, No. 6, pp. 61-64, No. 7, pp. 74-78, No. 8, pp. 90-95. Budapest, February 7, 14, 21, 1914.

With the object of throwing more light on the question of the creative power or the sterility of cryptorchids, the writer subjected the testicles which had been retained by monorchid horses to a rigorous histological investigation as to their sperm-producing capacity.

The result of his investigations can be summarized as follows. Independently of whether the testicles had been retained in the abdomen or in the inguinal canal, and of the age of the animal within the limits of 2 to 3 years, the generative cells in the tubuli were represented only by earlier stages of development, as spermatogones or most spermatocytes. Such testicles therefore resemble normal testicles of young animals, with the essential differences that in the former degenerative processes point to the cessation of development, while in the latter the conditions for further development exist. The degeneration concerned more the generative cells than Sertoli's cells, while the so-called plasma cells on the contrary seem more numerous.

The formation of sperm in the retained testicles does not reach the degree of being vital and fertilizing; consequently stallions that are completely cryptorchid must be considered as sterile and monorchid stallions as owing their generative power only to the testicle which descended normally into the scrotum.

If the male sexual characters are well marked in completely cryptorchid horses, this is explained by the fact that the so-called plasma cells which produce the inner secretion have not suffered any degeneration.

- 538 - **Sugar in Blood Plasma.** — BIERRY, H. and FANDARD, L. in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, Vol. 158, No. 1, pp. 61-64. Paris, January 5, 1914.

The blood of horses, chickens and dogs was examined for sugar and it was found that venous plasma was always richer in sugar than the corresponding arterial plasma.

- 539 - **Influence of Fluorine on the Animal Organism.** — SCHWYZER, F. in *Biochemische Zeitschrift*, Vol. 60, Part I, pp. 32-42. Berlin, February 14, 1914.

Experiments with rabbits led the writer to conclude that fluorine introduced into the body caused a loss of lime, chlorine and fat from the bones; even in daily doses inferior to one millionth of the live weight it acts as a poison, and consequently is strictly to be avoided for preserving mashes for live stock and similar uses.

- 540 - **The Food Value of Certain Grasses.** — GRÉGOIRE, A. and CARPIATY, E. in *Rapports et Communications du Ministère Belge de l'Agriculture et des Travaux Publics*, No. 8, pp. 5-48. Brussels, 1914.

The following grasses, Italian ryegrass (*Lolium italicum*), English ryegrass (*Lolium perenne*), tall fescue (*Festuca elatior*), tall oat grass (*Arrhenathera elatius*) and timothy (*Phleum pratense*), were investigated from two points of view: 1) their food value, and 2) the assimilation by the animal of the

	Dry matter		Crude protein		Crude fat		Nitrogen free extract		Crude fibre		Ash		Pure protein		Phosphoric acid		Lime	
	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)	Grégoire	Pott (mean)
<i>Italian ryegrass:</i>																		
1st cut (Sep. 8, 1908) . . .	85	86.8	8.76	9.9	2.5	3.1	44.61	20.21	22.9	9.38	7.5	7.93	0.814	0.728	—	—	—	—
2nd » (June 15, 1909) . . .	85	4.43	0.98	0.98	0.98	43.4	24.00	5.40	5.40	5.40	5.40	3.77	0.456	0.418	—	—	—	—
<i>English ryegrass:</i>																		
1st cut (Sep. 8, 1908) . . .	85	10.18	9.1	2.32	2.0	39.72	23.42	33.8	9.36	6.4	8.95	0.921	0.683	0.417	—	—	—	—
2nd » (June 15, 1909) . . .	85	5.24	1.16	1.16	46.51	25.76	6.33	6.33	6.33	6.33	4.21	0.513	0.417	—	—	—	—	—
<i>Tall fescue:</i>																		
1st cut (Sep. 8, 1908) . . .	85	10.51	1.97	1.97	43.30	21.56	7.67	7.67	7.67	7.67	9.17	0.761	0.586	0.354	—	—	—	—
2nd » (June 15, 1909) . . .	85	6.91	8.0	2.25	2.3	43.34	44.67	26.0	7.83	7.0	5.99	0.573	0.354	0.354	—	—	—	—
3rd » (July 12, 1909) . . .	85	5.55	2.12	2.12	39.97	26.55	10.52	10.52	10.52	10.52	4.26	0.462	0.354	0.354	—	—	—	—
<i>Tall oat grass:</i>																		
1st cut (June 3, 1910) . . .	85	5.07	6.2	1.18	1.9	34.97	35.13	29.5	8.65	7.6	4.30	0.534	0.282	0.378	—	—	—	—
2nd » (Sep. 6, 1912) . . .	85	5.47	1.38	1.38	37.51	31.89	8.77	8.77	8.77	8.77	4.39	0.633	0.378	0.378	—	—	—	—
<i>Timothy:</i>																		
(July 13, 1910) . . .	85	4.54	7.6	0.72	2.3	45.20	27.90	27.4	5.92	4.7	4.22	0.388	0.371	0.371	—	—	—	—

TABLE II. — *Results of digestibility trials.*

Kind of hay	Percentage digestibility: mean of 3 sheep.					
	Dry matter %	Organic matter	Crude protein	Crude fat	Nitrogen free extract	Crude fibre
<i>Italian ryegrass:</i>						
Cut young	82.15	74.6	56.4	53.4	79.1	73
Cut in flower	80.32	58.7	26.4	36.4	68.0	46
<i>English ryegrass:</i>						
Cut young	80.06	76.0	62.1	53.1	80.6	76
Cut in flower	80.93	59.8	40.9	48.9	64.7	55
<i>Tall fescue:</i>						
Cut young	83.28	70.7	63.2	55.9	75.4	67
Cut in flower	84.42	63.3	53.6	73.0	64.3	53
Cut after flowering	87.84	56.7	51.0	82.6	62.1	47
<i>Tall oat grass:</i>						
Cut young	85.47	57.8	46.5	52.3	54.4	63
Cut in flower	85.90	56.4	43.7	48.7	47.5	66
<i>Timothy:</i>						
Cut after flowering	83.93	54.4	37.1	60.1	62.5	43

and phosphoric acid contained in the grasses. The first three were sown on an old experimental field at Gembloux in May 1908; no manure was applied, a good set was obtained and the first crop cut in September 1909 under good weather conditions. In April 1909 the plots received 180 lb of nitrate per acre, and half of each plot was cut on June 15, the hay being got up in good condition, while the other half was not cut till late and made in bad weather. The other two grasses were also sown on an old experimental field at Gembloux, but on land in good heart. Seed was sown in 1909 and came up normally; 180 lbs. of nitrate were applied in April. A good crop of tall oat grass was obtained, but only a moderate one of timothy.

Food value of hay. — Feeding trials were carried out on sheep in Küt feeding boxes similar to those in use at the Möckern Experimental Station; the faeces and urine were also collected by the same system as employed at Möckern. The trials lasted a fortnight after a preliminary preparatory period of a week. The hay was chaffed and carefully mixed with other foods, samples being analysed by Belgian official methods with slight modifications. The results are tabulated in Table I and compared with those obtained by POTT for similar plants.

The two sets of figures are somewhat different: the two kinds of ryegrass and timothy contain less albuminoids and the two former more nitrogen-free extract than POTT's samples and the percentage of fibre in English ryegrass is also lower; tall oat grass is poorer in nitrogen-free extract

TABLE III. — Average amount of total organic matter and digestible matter (and their starch value) provided per day and per 1000 kilog. live weight in the different kinds of hay (in kilog.).

Kind of hay	Total organic matter	Digestible material				Starch Value
		Crude protein	Crude fat	Nitrogen free extract	Crude fibre	
<i>Italian ryegrass:</i>						
young	15.984	1.043	0.231	7.456	3.037	8.3
in flower	14.200	0.209	0.064	6.105	1.975	5.7
<i>Polish ryegrass:</i>						
young	15.448	1.293	0.252	6.533	3.667	8.4
in flower	14.642	0.398	0.105	5.607	2.647	5.9
<i>Fescue:</i>						
young	16.298	1.400	0.233	6.884	3.080	8.8
in flower	15.285	0.729	0.328	5.452	2.602	6.4
after flowering	15.823	0.583	0.425	5.303	2.656	5.8
<i>Tall grass:</i>						
young	15.172	0.506	0.143	4.028	4.053	5.0
in flower	13.316	0.386	0.100	2.826	4.055	3.8
<i>By:</i>						
after flowering	15.502	0.309	0.159	5.184	2.239	3.9

richer in cellulose. These differences show how the composition of hay may vary from year to year and the very approximate value of figures cognised tables.

Results of digestibility trials are given in Table II, and in Table III average amount of total organic matter and digestible material (together with their starch values) provided in the rations per day and per 1000 live weight.

KELLNER's maintenance ration for an adult sheep is as follows :

Dry matter	18.23 kilog.
Crude digestible protein	1.20 "
fat	0.20 "
Nitrogen-free extract + fibre . .	10.50 "
Starch value	8.30 "

Of the experimental rations the two ryegrasses and the tall fescue are the only ones which supplied amounts of food elements up to KELLNER's standard, and Table IV gives the gain or loss of nitrogen undergone by the animals calculated from the difference between the nitrogen digested in the food and that excreted in the urine, and stated as loss or gain of protein per day and per 1000 kilog. live weight.

TABLE VI. — *Kellner's digestibility coefficients.*

Kind of hay	Protein		Fat	Nitrogen free extract	Crude fibre
	crude	pure			
<i>Italian ryegrass</i>	63.4	54.4	43.8	65.5	65.1
<i>English ryegrass</i>	50.0	39.3	29.9	55.1	51.0
<i>Tall fescue</i>	50.0	38.4	29.9	53.7	53.1
<i>Timothy</i>	47.1	41.6	41.7	62.0	53.0

led to believe that the two following causes might account for the observed loss of phosphoric acid and lime :

1. The acidity of the ash of grasses, due more especially to silicic acid produces an eminently toxic effect ; silicic acid goes into the circulation where, notwithstanding its weak acid properties, it plays an important part causing a loss of mineral bases and eventually even of phosphoric acid

2. The movement of phosphoric acid is regulated by that of the lime with which it is intimately connected. It would therefore appear that the insolubility of the phosphoric acid in the ash of grass is an important factor, making it difficult for the animal to make good the losses which follow as a consequence of the lime drainage caused by the silicic acid

The mineral matter of a ration composed solely of grass hay should therefore be supplemented. In practice this is usually done by adding to the ration fodders with alkaline ash, such as leguminous fodders or roots but failing these means, calcium carbonate should be added. The writer carried out some trials in which calcium carbonate was introduced into the ration, and observed that the latter substance in no way diminished the digestibility of the grasses, while it prevented the losses of lime and phosphoric acid to the animal body, so that a small gain was actually recorded

CONCLUSIONS.

1. The figures given in tables of food values cannot be more than approximately accurate in so far as they deal with hay made from certain grasses.

2. The digestibility of hay decreases with the increase in age of the grasses from which it was made, but the amount of decrease varies considerably with the different species, which may be placed in the following ascending order : tall oat grass, tall fescue, English ryegrass, Italian ryegrass.

3. The food value of various hays differs considerably from that given by KELLNER. Tall fescue heads the list and is followed by the two rye grasses and tall oat grass.

4. A ration composed solely of hay made from grasses causes loss of phosphoric acid and lime to the animal organism, more especially when

the hay is cut very young. The chief cause for this would appear to be the silicic acid present in the grasses, and possibly also the low solubility of the phosphoric acid.

5. The addition of calcium carbonate to the ration has no effect on solubility, but reduces the losses of phosphoric acid and lime.

1 - **Bacteriological Research on Ensilaged Forage** (i). — GOREN, C. in *Annuario della Istituzione Agraria Dott. Andrea Ponti*, Vol. II, pp. 165-179. Milan, 1911.

As a result of ten years' investigation on the subject, the writer distinguishes four types of silage:

1. Silage in which butyric acid bacteria predominate.
2. Silage in which lactic acid bacteria predominate.
3. Silage in which putrefying bacteria predominate.
4. Silage comparatively free from bacteria.

The first two may be considered normal types, the remaining two abnormal types of silage. Abnormal silage may be produced either when the temperature of fermentation is too low, which favours the development of putrefying bacteria, or when the temperature is too high, which destroys all bacterial life; consequently the making of successful silage depends chiefly upon the amount of heat produced in the silo, which may be controlled by the packing, and only to a lesser extent upon the moisture content and quality of the forage. The optimum temperature for the silo is 50° C. (122° F.), at which temperature lactic acid bacteria predominate; if the temperature rises to 60° C. (140° F.) the butyric acid bacteria are especially favoured.

With regard to the question as to whether it is advisable to classify silage as "sweet" and "sour", the writer observes that strictly speaking silage is more or less acid and that consequently it should all be classified according to the degree and nature of its acidity, though it does not follow that the quality of the silage can always be determined from its degree of acidity: the rule holds good only within certain limits.

Opinions are still divided with regard to the relative value of the two types of silage for food in general, but when fed to dairy cows the latter gives preference to the lactic acid type, as the butyric acid type is able to taint the milk and butter.

The writer has also carried out some experiments on seeding pure cultures of lactic bacteria into the silos. The experiments are not yet completely finished, but the results obtained up to the present lead to the following conclusions:

1. That the addition of lactic acid bacteria to the silo improves the keeping qualities of the silage.
2. That different lactic acid bacteria act differently upon the silage.
3. That even at a relatively low temperature it is possible to make so-called sweet silage.

(1) Cf. *Ricerche Batteriologiche sui Foraggi conservati nei Silos*, by the same writer, the years 1906, 1908, 1909, 1910, 1912. Premiata Tipografia agraria, Milan. (Ed.)

542 - **Toxic Bran.** — MARCHADIER and GOUJON in *Annales des Falsifications*, Year No. 64, pp. 77-81, Paris, February 1914.

Bran undergoes degenerative changes on storage which may be the cause of serious disturbances when it is fed to animals. In order to find a method of determining whether any given sample of bran be fit for food the writers carried out the following experiments: 100 tons of fresh bran were put into a heap in November 1912; in the following February the formation of lumps was observed, while in March the temperature had risen considerably and the centre of the heap was carbonized. Samples were drawn 1) from the outside of the heap which was in friable lumps but not discoloured, 2) from a little further in where the lumps were less friable and dun coloured, and 3) from the centre where the bran had become a compact black mass yielding a fracture rather like that of linseed cake made under high pressure, and looking and smelling of roasted chicory. A sample of the same bran kept apart from the heap was also taken, as well as a fresh commercial sample. They were all analysed and yielded the following results.:

	Commercial sample	Bran not put in heap	Bran from the outside of the heap	Bran from lower layers of the heap	Bran from centre of heap
Moisture	12.7	14.8	13.6	11.6	11.5
Acidity as { total	0.074	0.172	0.211	0.776	2.062
fixed	0.074	0.172	0.211	0.578	1.445
H ₂ SO ₄ { volatile	0.000	0.000	0.000	0.198	0.617
Fat	1.32	1.70	1.10	2.64	4.98
Ash	5.5	5.8	5.9	6.0	6.2
Anaeroxidase	present	present	present	absent	absent
Soluble in cold water	10.65	12.35	4.35	9.80	18.30

The acidity increases as fermentation proceeds, so that at the end of the process the acid content is fifteen times as high as it was originally and the oxidising enzymes disappear in the later stages of fermentation. The writers suggest that these two factors be taken as a base for determining whether bran be fit for food, classing the bran as follows:

	Acidity
Normal bran	below 0.150
Bran undergoing decomposition, not yet unfit for food but liable to become so very rapidly.	0.150 to 0.300
Bran unfit for food	above 0.300

1 - **The Rate of Liberation of Hydrocyanic Acid from Linseed** (1). — COLLINS, S. H. and BLAIR, H. in *The Analyst*, Vol. XXXIX, No. 455, pp. 70-72. London, February 1914.

Linseed was digested with water to which other substances were added experimentally and the resulting hydrocyanic acid, when formed, was removed, by a stream of hydrogen gas, absorbed in weak caustic soda solution and estimated colorimetrically by the prussian blue test. One particular sample of linseed yielded 0.38 mgm. of hydrocyanic acid per gm. of linseed. The velocity of reaction was such that one half of the total amount yielded in 46 minutes, whereas solutions of hydrocyanic acid in water yielded one half the total amount in 26 minutes, reaching in 3 hours' time from 20 to 99 per cent. of the total amount present. When the linseed was acidified to represent digestive conditions, no hydrocyanic acid was liberated, and similar negative results followed the use of pepsin and rennet in acid solutions. Even hydrochloric acid of $\frac{N}{100}$ strength prevented the enzyme from acting, and $\frac{N}{1000}$ strength produced a marked slowing in the rate of liberation of hydrocyanic acid from linseed.

With non-ruminant animals the acidity of the stomach would render the enzyme inactive. In the case of cattle where 2 to 3 lbs of linseed may be fed daily, the writer attributes the usually innocuous effects partly to the influence of other foods in slowing down the action, and partly to the fact that the hydrocyanic acid formed must be largely evaporated into the air during rumination with its attendant continual regurgitation of the food into the mouth. The linseed "mash" fed to calves is a more likely source of danger. Linseed treated with a large volume of boiling water and kept at 100° C. for half an hour produced no hydrocyanic acid gas, but at 60° C. evolution of acid was only slightly checked, though almost completely checked at 90° C.; linseed heated dry to 100° C. or ground finely produced an increased amount of hydrocyanic acid. Linseed mash prepared in a dry condition generated hydrocyanic acid from these lumps, slowly at first, but rapidly when the lumps were broken up, showing that the enzyme had not been destroyed in the comparatively dry material inside the lumps.

The extractives, such as petrol, ether, chloroform, etc., had no marked effect on the enzyme, so that the removal of oil from the seed in the manufacture of linseed cake by the solvent method, far from producing a safer material, only tends to concentrate both enzyme and glucoside.

2 - **Live Stock in Morocco.** — MONOD, T. in *Revue générale des Sciences pures et appliquées*, Year 25, No. 7, pp. 341-346. Paris, April 15, 1914.

Though Morocco is a country eminently adapted to agriculture and stock, its production has remained at a low level owing to the defective methods practised by the natives, who make no attempts to save their stock in years of drought. Conditions could be considerably improved by creating food reserves to fall back upon in periods of drought, such as hay, forage crops, irrigated meadows or maize and sorghum silage; and

(4) See No. 1352, B. Dec. 1913.

(Ed.).

2) tapping springs and building stone drinking troughs to improve hygienic condition of the present water-holes, which are a constant source of disease to stock.

Horses.— The type varies with the soil in the different localities but all are preeminently saddle horses and belong to the Berber type. They are quiet, hardy, mettlesome, but are lacking in breed and shapeliness. Usually they are less well cared for than in Algeria, brood mares being ill fed and generally undersized. Where they receive rather better treatment, such as in the Marrakech district, the superiority of the animal is evident. The introduction of Arab thoroughbreds should prove very beneficial and the work undertaken in this direction by the State should give excellent results.

Mules are very popular in Morocco both for agricultural purpose and as carriage or saddle beasts; they fetch a good price (£24 to £30) and their improvement by means of selection and the use of imported asses should prove remunerative.

Cattle.— A large demand and a low production due to droughts and diseases have combined to raise prices abnormally, *i. e.* to twice the value of two years ago. Numerous breeds exist, all hardy and fattening readily when well fed. Cattle receive no kind of care; they are allowed to breed promiscuously and are kept out without any kind of shelter. Yet it should be possible to obtain both a good milking breed and a good working breed from the native animals.

Sheep.— Sheep number 1 500 000 in Western Morocco and 900 000 in Eastern Morocco in those districts under French influence, and would be liable to vast improvement under a judicious system of breeding and selection.

Pigs belong to the Iberian race and are spreading all over the country as the natives have not the same antipathy for that species of animal as have the Algerians. A good export trade to Europe, where the product finds a ready market, may be predicted.

545 — **Live Stock in New Caledonia.** — LAFFORGUE, G. in *La Vie agricole et rurale*, Year 8, No. 7, pp. 175-177. Paris, January 17, 1914.

New Caledonia is situated on the southern limit of the tropical zone and has a remarkably constant climate, with a mean temperature of 68° to 77° (minimum 57° F. and maximum 97° F.), rather long droughts and occasionally very wet periods. The soil is only moderately fertile and may be put under coffee, but live stock rearing is the chief resource of the country.

Colonists embarked on cattle rearing from the outset, using as basic animals of the Shorthorn, Hereford, Devon and Aberdeen-Angus breeds. Crosses of Shorthorn-Devons or Shorthorn-Herefords are now commonest and of these two, the former seems the better adapted to the country. Large herds, up to 1000 head, range freely on the open stations, which may cover an area of 15 000 acres each, in charge of mounted stockmen who are usually seconded by their dogs. Males and females are never separated and breed promiscuously.

In 1908 New Caledonian cattle underwent a serious crisis due to two principal causes: 1) the deterioration of pastures owing to frequent overstocking, which destroys the grasses and gives the weeds a chance of getting a hold; and 2) running males and females together, which results in numbers of the females being called upon to perform maternal duties before maturity, the annual castration of males not required for breeding purposes being an insufficient preventive measure. Better times are dawning, colonists are beginning to co-operate in order to improve the management of live stock, and stations are being reduced in size in order to lead to a more intensive form of agriculture. Such measures should be completed by the erection of a cold storage factory, which would make the export of meat remunerative, for New Caledonia is too remote from centres of consumption to make the transport of meat in the form of live cattle an economic possibility.

46 - **Short-faced Abyssinian Mules.** — DECHAMBRE, P. in *Bulletin de la Société Nationale d'Acclimatation*, Year 61, No. 5, pp. 129-132. Paris, March 1, 1914.

The writer mentions an abnormal head conformation frequently met with in Abyssinian mules and interesting from its analogy to special conformations in other types of animals. It consists in a considerable depression at the base of the subnasal bones together with an underhung jaw giving the animal a bulldog expression.

Mules possessing this characteristic are in no way inferior to normal animals; they are small, strong and well ribbed up; but, of course, should an abnormality be developed beyond a certain point, both the breathing and the articulation of the jaws are interfered with and the animal suffers. From an enquiry made by Dr. GROSLAMBERT, it would appear that the short-faced mules, or "fongga", are the result of purely accidental variations which are not inherited. Analogous conformations in other types of animals are represented by the bulldog, the "nātos" or short-faced Chilean cattle, and tumbler pigeons.

7 - **Present State of Milk Record Associations in Austria.** — ROSSMANN, RITTER von in *Mitteilungen des Zuchtvereins für das alpine Grauvieh in Steiermark*, Year 2, No. 1, 9 pages, 1914.

Milk recording has only comparatively recently gained a footing in Austria (1), but it has rapidly become important, as may be gathered from the following data.

In East Galicia milk records are registered by the Lemberg Agricultural Society in 140 herds containing 4344 cows. For this object a special office exists, employing thirteen persons besides the director.

In West Galicia two associations were founded in 1904, followed by 70 more in 1906. At present the number of animals under record is 50, of which 160 belong to small farmers.

In Bohemia regular test milkings have been carried out since 1905

(1) See article: « The Present State of Dairy-Cow Testing », B. Oct. and Nov. 1912. (Ed.)

exclusively by cooperative breeding and economic associations. Up to the present 3500 cows on 692 farms have been tested.

Moravia has, at present, two testing associations with 50 members and 320 cows.

In Upper Austria the Simmentaler Cattle-breeders' Federation at Schärding has kept milk records since 1904. Since 1912, 96 breeders with 888 cows have submitted to the control. From 1904 to 1912 the average milk yield rose by about 44 gallons per head per annum. In 1910 the Federation of Simmentaler Breeders at Ried began the work of milk recording, and the next year the Montavon breeders followed suit. In the latter federation, 191 members with 2879 cows submit to the control.

In Salzburg, for the last two or three years six cooperative breeding associations with 1675 cows have been keeping milk records.

Extensive test milking is practised in the Tyrol also, but on account of the communes and farms being so widely scattered in the high mountains, a good deal is left to the private recording of the farmers.

In Styria, the "First Styrian Milk Control Association" has carried out regular milking tests since 1904. In that year it numbered 11 members with 365 cows, while in 1914 there were 30 members and 1050 cows. The contributions for large landowners are 16s 8d per year and 2s 6d per cow per year, while peasant owners pay only 10d per year per cow. The association has a yearly State subvention, which has grown gradually from £33 4s to £125. The tests are made three times a week, three persons being employed for the purpose.

Besides the above, milking tests have been practised in Styria by the Federation of Murbodner Cattle-breeding Cooperative Association since 1910. At present 1632 cows are under control.

548 - **Red Flemish Cattle.** — RAQUET, H. in *Annales de Gembloux*, Year XXIV, No. 1, pp. 81-102. Brussels, February 1, 1914.

The total number of Flemish cattle is estimated at 700 000 head in France and 500 000 head in Belgium. In Flanders in 1912, their density was about 1 to 2 $\frac{1}{2}$ acres. As milkers they are almost equal to the Dutch breed when under a favourable system of management: 14 cows on the farm of Mr. Talpe of Hooghlede, West Flanders produced during the seven years 1902-1908 an average annual yield varying from 780 to 1080 gallons with the nature of the season, being highest in the wetter seasons.

At agricultural shows in Belgian Flanders, points are awarded according to the following scale:

Cows.		
General appearance, frame	20	} general conformation 50 points
Dorsal line	10	
Head, horns, breed characteristics, coat colour	10	
Skin	10	
Udder and teats	20	} milking qualities 50 points
Milk veins,	20	
Escutcheon	10	
		100

<i>Bulls.</i>	
Dorsal line	20
Frame	20
Fore quarters	20
Skin, horns	10
Pedigree, milking characteristics, escutcheon	10
100	

The breed is very adaptable and has been substituted for Swiss and other cattle in the province of Santander (Spain). It has successfully established itself in Argentine, but the Argentine strain, which is the result of crossing the old red-and-white Flemish cattle with Shorthorns, is more like the old Zealand cattle than the modern Flemish breed. The breed, represented by 52 bulls and 11 heifers from the best Flemish herds, has been imported into São Paulo, Brazil.

The French herd-book was started in 1886 at Bergues, while the Flemish one is of more recent origin and has its headquarters at Roulers in Flanders. The writer considers that for registration purposes, the breed should be divided into three sections: 1) milking type, red with a black nose, the original type; 2) beef type produced by crossing with the Shorthorns, red with a pink nose; and 3) general purpose type with dominant milking qualities, red and white with a pink nose. He further suggests that the fee for entering should be abolished as an encouragement to breeders.

- Determination of Growth in Grazing Cattle. — BRUCHHOLZ, K. G. in *Deutsche Landwirtschaftliche Tierzucht*, Year 18, No. 16, pp. 185-187. Hanover, April 17, 1914.

The writer divides young cattle into three groups according to the nature of the growth they make while at grass: 1) Those which form chiefly muscle and flesh: these eventually grow to big beasts, and when still young give promise of becoming good breeding, milking or fattening stock. 2) Those in which the increase of weight is almost entirely due to fat: they always remain small, and are less valuable than those of the first group. 3) Those which make little increase in fat, bones or flesh: they will always be poor animals.

To find out to which category the young stock at grass belong, it is essential to take body measurements as well as noting the increase in weight. The writer recommends taking only the girth measurement, at the beginning and end of the grazing time, as taking detailed measurements of a large number of animals is very laborious. The value of this method is shown by the accompanying table, in which data are given for eight heifers; these were turned out to grass in May, at eighteen months old, and taken off in October. Four months after dropping the second calf they were weighed again for comparison with the data obtained earlier.

It may be noted that the chief increase of live-weight took place in May and June; four of the heifers showed much less increase in July and August, and three of them a decrease in September. The girth increased much more evenly.

Increase in weight and girth of heifers.

Number of heifer	1	2	3	4	5	6	7	8
Increase in live-weight during grazing period. . lbs.	216	249	129	64	115	164	293	1
Increase in girth during grazing period in.	12	10	9 $\frac{1}{2}$	8	7 $\frac{1}{4}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	1
Live-weight 4 months after second calving. . . lbs.	1 456	1 318	1 397	1 273	1 278	1 154	1 067	10

The table shows clearly that the heifers which increased most in girth were the ones which eventually made the heaviest cows, while the increase in live-weight at this period shows no correlation with the live-weight of the mature animals.

550 - **Heredity of Twin Births in Cattle.** — UHLMANN, E. in *Deutsche Landwirtschaftliche Tierzucht*, Year 18, No. 14, pp. 163-164. Hanover, April 3, 1914.

The writer has investigated a herd in which the birth of twin calves has been very frequent. He found two sisters which had borne twins 2 out of 7 and 4 out of 9 times; the dam of these cows (as well as the two other sisters) never had twins, but the maternal grand-dam once gave birth to twins. Two daughters of the first cow have also given twins (each 1 out of 3 times), while two daughters of the second cow have calved two and four times respectively without producing twins.

The bulls used have been of various strains not known to have a tendency to twin-production.

The evidence seems to point to a twin-producing character being inherited from the grand-dam mentioned.

551 - **Morocco Sheep and their Products.** — *Bulletin économique du Maroc*, Year No. 6, pp. 5-7. Rabat, August 15, 1913.

There are two chief breeds of sheep in Morocco.

1. The *Muluya Basin* breed, found in the high plateaux of Eastern Morocco, has a close fleece very similar to the Merino; it is hardy and resistant to drought.

2. The *Atlantic* or *Western* breed which is a kind of degenerate merino.

These types vary to a certain extent; in the neighbourhood of Tangier some imported Spanish Merinos have improved the local sheep, while in the neighbourhood of Fez two modifications are met with: the *Beni-Hassen* with a long silky fleece, and the *Berber* which is smaller with a heavier coarser fleece.

The principal sheep-breeding centres are the High Plateaux of Eastern Morocco and the fertile plains of the Atlantic coast, the Rharb district, the district of Beni Hassen, parts of Shawia, and above all the Marakesh district, the annual production being approximately as follows:

Rabat district	100 000
Fez and Sifru district	50 000 to 60 000
Meknes district	20 000 " 25 000
Shawia	50 000 " 60 000
Mazagan and Saffi districts	300 000

In the Rabat district, prices range from 12s to 17s per head. Exports by sea are prohibited; sheep may leave the country by way of Algeria (approximately 200 000 per annum are exported), and are taxed 3d per head on passing out at the frontier. Shearing is carried out in spring and natives take the fleeces to Jewish or European dealers the following year and receive 1s 4d to 2s per fleece. The wool is graded into three qualities:

1. *Oudigha* — short and fine, comes from Shawia and Tadla and fetches the highest price.
2. *Aboudia* — medium quality and unwashed, comes from the Rharb district and the Valley.
3. *Beldia* — low quality, comes from Rabat, Saffi, and Mazagan districts.

Exports are taxed 4d a lb. on washed wool and 6 1/2d a lb. on unwashed wool, the washing having caused the wool to loose 50 to 60 per cent by weight. Formerly France was the only importing country, but Germany takes a large part of the wool produced, as is shown by following table:

Importing country	Value of imported Moroccan wool			
	1909	1910	1911	1912
	£	£	£	£
France	74 250	91 600	106 800	32 740
England	6 000	13 060	5 250	4 290
Germany	26 990	69 630	90 240	32 580

Large quantities of skins are exported. Sheep skins are also largely tanned into slippers, which are then exported to Algeria and Egypt.

- Development and Prospects of Sheep Breeding for Wool in German South-West Africa. (Lecture given by Prof. GOLF at the meeting of the Kolonial Wirtschaftliches Komitee) in *Zeitschrift für Schafzucht*, Part 4, pp. 81-86, Hanover, April 1914. The breeding of sheep for their wool is destined to become the most important branch of farming for at least one half of the total area of German South-west Africa. The most important area is the whole south of the colony, that is all the country south of a line running eastward from Windhuk. Then in the northern half of the colony there is a western dry area which is bounded on the west by the Namib desert and on the east by a line drawn from Windhuk to the Kunene passing through Walmaru, Omaruru and Franzfontein. To the north and east of this district are more suitable than sheep, as the thorny pastures injure the fleeces. On April 1, 1912, the number of wool sheep in German South-west Africa was 46 901. The yield of wool is inferior to that of South Africa, which

is 8.8 lbs. of unwashed wool per head; in 1910 the export from German South-west Africa was 186 180 lbs., worth £37 40s. If this industry is to develop satisfactorily, the breeding and management must be improved with the introduction of special wool-producing breeds, the aim being the production of wool of the best quality.

As the most suitable sheep the writer recommends Cape Merinos, which might be improved by the introduction of pedigree rams. In the North of the colony the German Tuchwollschaf would probably be suitable for crossing; in the south, however, the German, Australian or African Karwollschaf would be more advisable for the present.

553 - **Present State of Milk Recording for Goats in the German Empire.** - Report made in the autumn of 1913 to the German Agricultural Society, subcommittee on milk records for goats, by Dr. MÜLLER of Dortmund; in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year 29, Part 9, pp. 138-140. Berlin, February 28, 1914.

The German Agricultural Association (D.L.G.), in the summer of 1913, addressed an enquiry to all the central agricultural offices (*landwirtschaftliche Zentralstellen*) on the present situation and development of milk recording for goats, and received the following information.

Milk records are kept at present in the Grand Duchy of Hesse-Nassau (district of Wiesbaden), in the province of Saxony, in Rhine province, in Westphalia, Hanover, Brunswick, Coburg and Saxe-Altenburg, and in the Kingdoms of Württemberg and Saxony. In several localities, as in Silesia, Oldenburg, Baden, Bavaria and Lippe, record of performances has been begun, but up to the present there are no complete yearly records available. The milking tests, which give more or less useful figures, are about 500, and refer to the most different breeds of goats. The first tests appear to have been made in the Grand Duchy of Hesse and in the Kingdom of Saxony about the end of the 19th century. Recently, thanks to the increasing recognition of the importance of milk recording work, it has been receiving considerable financial aid from the numerous agricultural central offices. Special instructions on the method of carrying out these milking tests are at present published only in Württemberg and Hanover, though short directions are to be found almost everywhere.

The best results have been obtained in those localities in which a special control assistant was available (Westphalia), or in those in which some organization took an interest in milk control.

Most of the observations, especially of late years, are no longer made by measure, but by weight, and if possible every fortnight. In only a few localities are records kept of the weight, age and mating of the animals, and of the number and weight of the kids dropped. Data on the height and girth, and on the feeding and utilization of the food, are nowhere to be found. On the other hand in some places the net returns have been calculated. The results vary between - 5s 9d and + £7 10s per animal per year.

The results hitherto obtained are insufficient for the clearing up of several questions connected with the keeping of goats, to a great extent

because they have been obtained by different methods. It is therefore highly desirable that in future uniform methods be adopted.

- 54 - **The Olfactory Sense of the Honey Bee.** — MC INDOO, N. E. (Bureau of Entomology, U. S. Dep. of Agriculture, Washington, D. C.) in *The Journal of Experimental Zoology*, Vol. XVI, No. 3, pp. 265-345. Philadelphia, Pa., April 5, 1914.

Olfactory pores were found on the bases of the wings, and on the rochanter, legs, and sting. They numbered approximately 2600 in the drones, 2200 in the workers, and 1800 in the queen. They are described in detail.

- 55 - **Silkworm Rearing in Madagascar** (1). — 1. FAUCHÈRE, A. in *L'Agriculture Pratique des Pays Chauds*, Year 14, Nos. 130-132, pp. 12-23, 92-102, 140-147. Paris, January to March, 1914. — 2. *Journal d'Agriculture Tropicale*, Year 14, No. 153, pp. 89-91. Paris, March 31, 1914.

A full account is given of the treatment of silkworms in Madagascar; the Centre is the most favourable part for *Bombyx mori*, called "landikely".

The native worm is *Borocera madagascariensis*, known as "landibe"; this is reared in the open, either in natural forests of "tapia" (*Uapaca lusiacea*) in the Centre and "afiafy" on the coasts, or in plantations of "tsitovina" (*Dodonea madagascariensis*) and *Cajanus indicus*. There are two roods in the season; the cocoons are grey and cannot be reeled: they are herefore carded and spun. This silk gives rise to a considerable trade in the island.

- 56 - **Silkworm Rearing in the Yalong Valley, China.** — LEGENDRE, A. F., in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, Vol. XIII, Parts I-III. Montpellier, July and October 1913, and January 1914.

The rearing of silkworms in China has been very little improved since early times, and it would probably be possible to double the yield at very little expense. The writer has studied silkworm rearing at a village near the Yalong river in Szechuan; it varies little throughout the Empire, unless subject to European influence, as at Canton and Shanghai.

In spite of the height (6000 to 7000 ft.), the eggs begin to hatch at the end of February or in early March; hatching is sometimes hastened by keeping the eggs in a warm room; it lasts three or four days.

Little attention is given to the worms; they are kept on heaps of leaves of mulberry (*Morus alba*) or "ta tchou" (*Cudrania triloba*), in baskets or on coarse bamboo mats; these are kept in the roof, and often above the kitchen, as the smoke from the green firewood is supposed to keep away insects.

The worms of the Kienchang district (Szechuan) moult three times: each stage lasts about 13 days, and spinning up takes another 10 days, so that the whole rearing period is 49 days. For the first two stages only *Cudrania* leaves are used; they are fed cut up small in the first stage, in large pieces or whole in the second. The leaves are picked once a day, as soon as the dew is off, and the number of meals is increased from four to

(1) See No. 967, B. Aug. 1913.

eight as the worms grow; in rainy weather they are not fed. It is supposed that leaves covered by the fine sand occasionally brought by the wind are fatal. The old leaves are not removed till there is a considerable accumulation of them, when the worms are picked off into baskets and then put back onto the fresh leaves.

The chief errors in the Chinese method are crowding together of the worms and not cleaning out often enough; for these reasons the worms are liable to disease. The only remedy known is to pick out the diseased ones, which can be done only imperfectly owing to the size of the mats.

For spinning up, dry rape stalks or oak twigs with the dead leaves on are used. Seven days after the cocoons are finished they are placed in the sun to kill the larvae, or in dull weather they are put in an oven.

The moths emerge from the cocoons kept for egg production 12 to 15 days after the beginning of spinning; a number of females are made to lay on each of the egg papers used: these measure about 17 by 11 inches.

Cocoons. — The cocoons are divided into six groups according to shape and quality. In a normal rearing there are 15 to 20 per cent. of the first quality and 35 to 40 per cent. of the next two, some 35 per cent. being inferior and 10 per cent. double.

About 33 fresh or 43 dry cocoons go to a Chinese ounce (37 gms.). The yield of raw silk does not exceed 9 per cent. of the weight of the fresh cocoons and 7 ½ per cent. is a good average; in bad years it may be only 4 to 4 ½ per cent.

The cocoons are of four chief colours: pure white, canary yellow, golden and green. The raw silk is dull and dirty-looking.

The yield from 25 gms. of eggs may be 23 kg. in a good year, and is 18 kg. in ordinary seasons, while in France 60 kg. is often obtained.

Breeds. — Four breeds are known, all being single-brooded and with eggs in clusters:

1. *Pé-ts'an* (uncoloured); two varieties, one with white legs (giving white cocoons) and the other with yellow legs.
2. *Houa ts'an* (speckled); each segment with a grey band posteriorly; legs yellow.
3. *Lao hou ts'an* (striped green); uniform dark brown, with pale yellow velvety legs; head striped with black; cocoon very full, but often green and therefore not liked.
4. *Ou ts'an*; less dark than the preceding, with the same striped head; prolegs yellow.

There is also a wild silkworm ("ié ts'an"), much like the "lao hou ts'an", living on mulberry.

Diseases. — "Pébrine" occurs occasionally in a mild form, and is supposed never to occur with "flacherie"; the latter breaks out every three or four years and carries off 90 per cent. of the worms. "Muscardine" takes about 1 per cent. of the worms, and "grasserie" (which prevents their spinning) about 10 per cent. A good many of the worms pupate without spinning.



Fig. 1
Position for turning.

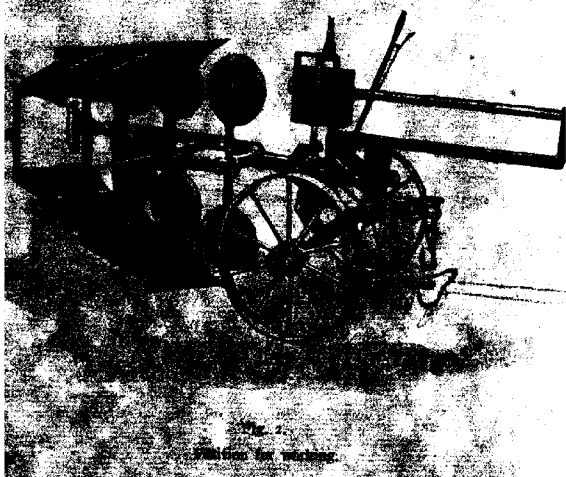


Fig. 2
Position for working.

One of the worst enemies is a fly, which oviposits in the larvae; its spread is encouraged by the practice of leaving the dead worms about instead of burning them.

Mulberries.—There are four varieties: *a*) with dentate leaves; *b*) with deeply divided leaves, not so well liked by the worms; *c*) with leaves pubescent along the veins, and *d*) the wild mulberry with pubescent leaves refused by the domestic silkworms. A trunk-rot is about the only disease seen.

FARM ENGINEERING.

17 - **Machines at the General Agricultural Show, Paris, 1914.** — RINGELMANN, Max in *Journal d'Agriculture Pratique*, Year 78, Vol. I, Nos. 11, 12, 13, 14, pp. 341-344, 371-373, 399-402, 438-439. Paris, March 12, 19, 26 and April 2, 1914.

This year the number of exhibitors was 619 as against 665 in 1913, the importance of the show, however, was not lessened and bore witness to the constant improvement in the construction of agricultural machines and implements. In this paper detailed descriptions and figures of several of the exhibits are given.

I. Apparatus for the mechanical tillage of the soil.—This class was presented by a large number of machines, including almost all those which took part in the Grignon and Trappes trials of last autumn. Among the tractors, windlass and hauling tractors, motor ploughs and rotary diggers, steam lorries and steam and petrol traction engines, the most noteworthy were the exhibits of the following firms: Compagnie internationale des machines agricoles de France, Bajac, G. Filtz, Stock, Bauche, Lefebvre, Doizy, Société de la Motoculture Française, Tourand and Derresse, Foden, Société française de matériel agricole of Vierzon, Pécard frères, Lanz, de Mesmay, Case Co., Pavesi and Tolotti, Dion-Bouton, Lefebvre, Landrin, and Amiot.

In the latest type of the DE MESMAY tractor, all four wheels are driving wheels, the object of this being to diminish the compression of the soil. Its width is only 50 inches so that it can be used in vineyards. It weighs empty about 3080 lbs. One of these machines (15 HP) took part in the international competition at Chassart in September 1913, when, according to the general report, it ploughed 6.92 acres to a depth of 6.3 inches in 1 hour 57 minutes, the work being excellent.

The CASE tractor (40 HP) weighs 7.26 tons when in working order; at Chassart it hauled a 6-furrow gang plough and ploughed 23.34 acres to a depth of 6.5 inches in 16 hours 4 minutes. It worked very regularly, never stopping for more than a few minutes to lubricate.

The LEFEBVRE windlass consists of a four-wheeled chariot bearing a vertical Abeille engine (12-15 or 20-25 HP), which drives a windlass mounted on a horizontal axis at right angles to the axles of the wheels. In ploughing, two of these machines are used as on the usual double-engine system. Each windlass weighs empty 5500 to 5900 lbs.

The LANDRIN windlass tractor carries a 45 HP engine and weighs about 5.4 tons; it can travel at four different speeds, from 1.86 to 7 miles per hour. The driving wheels are provided with twelve adjustable cleats which can project up to 4.8 inches. The motor by itself proceeds rapidly, then stops, anchors itself and hauls in the cable also at four different speeds, from 0.9 to 3.7 miles per hour. It can wind up to 500 feet of cable.

AMIOR's motor plough with a 40 HP Abeille engine is mounted on a four-wheeled frame. The driving wheels are provided with obliquely projecting cleats which are removed when travelling on roads. The plough is situated behind the motor; it is a double three-furrow Flemish gas plough, which can be lifted by a kind of crane worked by the motor itself, thus one man can drive and work the whole machine from his seat.

PAVESI AND TOLOTTI's motor plough consists of a triangular frame on three wheels, the front one being the steering wheel and the rear one the driving wheel. The latter is provided with blades which project vertically from the lower part of the tire only, and are worked by a special eccentric. The ploughs, from one to six in number, are placed at the side of the frame between the steering and driving wheels, so that the plough beam is pushed instead of being hauled. One man seated about the middle of the frame is sufficient to drive the machine. It is built in two sizes, to 20 HP and 40 to 50 HP.

Among the ploughs exhibited in Paris, an improvement deserves to be specially mentioned, viz. A. BAJAC's movable equilibrium counterweight. As is well known, it is extremely fatiguing for the ploughman, when using the heavy two or three-furrow double Flemish ploughs, to turn the round at the end of the furrow, or to move them on a road or headland. In order to obviate this drawback BAJAC fit a sliding cast iron weight (176 lbs.) on to a horizontal hollow bar attached to the fore part of the plough (see figs. 1 and 2). The weight can be retained at the extremity of the bar by means of a pin. When the weight is behind the axle of the fore-carriage it increases the weight of the plough and presses it into the ground, while, when pushed to the extreme end of the bar, it counterbalances the weight of the plough and allows the latter to be easily handled. This principle has been applied by BAJAC in several different forms; in the case of the largest ploughs the counterweight and fittings weigh as much as 440 lbs. and the weight is shifted by a small winch.

Sowing machines and drills.—Of the numerous drills, that exhibited by O. JOERISSEN is a force feed with an obliquely fluted feed shell, varying in size according to the nature of the seed. The quantity drilled is regulated by the speed of the feeding shaft; the gearing is enclosed in a casing and may be adapted to 16 different speeds.

In the « Baby » drill the fluting is double and parallel to the axle.

In LAVAULT's drills the feed consists of a series of claws acting alternately and varying in size according to the nature of the seed.

In CHARLIER FRÈRES's drills the shoe furrow openers are replaced by two disks set at an acute angle to each other.

Potato planters are represented by the *MOLINE* machines and by those *FASCIATX*; in the latter a boy seated on the planter throws the seed into holes made in the ground by blades mounted on a disk revolving at right angles to the axle of the wheels; by changing the gears the holes in the rows may be made at 18, 20 or 22 in. apart.

Sprayers and sulphurers. — Various models were exhibited by a number of makers, among whom *V. VERMOREL* showed a very complete collection.

BERGÈS BACHASSE AND Co. showed a pack-saddle sprayer in which two cylindrical reservoirs are fitted with a device to diminish or prevent the wave motion of the liquid in them which is so trying to the animal. It consists of a series of slotted felt disks arranged parallel to the ends of the reservoirs.

MIRANDE FRÈRES' sprayer is mounted on two wheels; equilibrium maintained by special harness and the whole can pass between rows of vines only 3 ft. 3 in. apart.

Harvesting machines. — *S. PLISSONNIER* exhibited a motor mower of *Valloton's* system; it is on three wheels with a 6 to 8 HP engine; it weighs about 1980 lbs. and cuts 3 ft 3 in. to 6 ft 6 in. according to the kind of crop and the slope of the field.

The *SOCIÉTÉ LA FRANCE* exhibited a motor reaper and binder. It carries a small 3 ½ HP engine which drives the reaping and binding apparatus, while the team only draws the machine. Somewhat similar machines are shown also by some American firms, in which the engine is partly supported by a small wheel.

GARNIER AND Co. exhibit a horse rake with several improvements, among which is one to deaden the shock of the teeth.

Among the reapers and binders *A. RIVET* presented one in which the reel slats instead of being placed in planes parallel to their axis of rotation are disposed helically so as to throw the grain obliquely on the platform canvas; the binding is improved by this means, especially in the case of short straw.

G. RICHOMME exhibited a combined binder and thresher which on the whole resembles a common binder, but the elevator is replaced by three successive threshing devices through which the cereal ascends; the straw then passes onto the binder deck and the grain is elevated by a belt and poured into sacks.

There were several *POTATO DIGGERS* and *BET ROOT LIFTERS*, among the latter one built by *GUICHARD & FILS* provided with an elevator that loads the beets into a cart.

Motors. — A number of internal combustion motors were exhibited, some burning paraffin, others heavy oil, naphthaline and producer gas; among these *DUBOIS'* two stroke motor is noteworthy for the distribution which is effected, not by valves, but by the displacement of the piston which uncovers alternately the opening for the escape and that for the admission of compressed air into the case.

Machines for the preparation of agricultural produce for market. Several threshing machines were exhibited, each of them presenting so improved detail. There were fans and straw elevators forming part of working with threshing machines or straw balers. Among the latter **LE BURE-ALBARET** exhibited a baler which turns out bales weighing 77 to lbs., and which is arranged so as to make small bales also, not exceed 22 to 33 lbs.; and the **COMPAGNIE INTERNATIONALE DES MACHES AGRICOLES DE FRANCE** exhibited a portable baler with a rapid stroke the piston and carrying a 4 HP horizontal engine on its fore-carriage.

G. BARRAULT exhibited a pulp and straw mixer for the thorough mix of small straw and beet pulp.

SIMON FRÈRES had a motor apple-crusher, being a combination of small engine and a crusher on the same small chariot.

For wine making there were several labour-saving machines: **MABIN FRÈRES' foulo-pompe** crushes the grapes and elevates them by means of screw working in a horizontal cylinder, which, after crushing them, for them up a vertical or inclined pipe. One of these machines driven by 3 HP motor could crush and raise to a height of 50 feet from 12 to 15 t of crushed grapes per hour.

Always with a view to saving manual labour many large hydraulic motor wine presses have been built and exhibited. In **MARMONIER ET MABIN** presses the hydraulic pumps are driven continuously by a motor and special device prevents the pressure exceeding a certain fixed limit.

In **MARMONIER'S** vertical pump a rapid displacement of 2.4 to 2.8 per minute can be obtained at first, which grows slower as the pressure creases. In **MABILLE'S** pump the pressure automatically rises again as it has sunk owing to the flow of a certain quantity of must.

Other machines and implements. — Among pumps one exhibited **C. DUQUENNE** for deep wells or borings is distinguished by a descend column of water under pressure playing the part of piston to apparatus situated at the bottom of the well called an aspirator. **GIC** exhibited an apparatus, connected with a small clock, which, on being set will automatically discharge into a manger a previously prepared ration of fodder when the given hour is reached.

558 — Motor Ploughing Competition of the North Kent Agricultural Association

— *The Implement and Machinery Review*, Vol. XXXIX, No. 464, pp. 1089-2
London, December 1, 1913.

On November 5, 1913, a motor ploughing competition was held the North Kent Agricultural Association at Farningham, at which following four machines competed, the prize offered being a gold medal.

Saunderson's « Universal » Model G, 18 to 20 H.P. agricultural motor and a Howard 3-furrow B. Z. plough,

The Ideal Agricultural Motors Co's « Ideal » agricultural motor and a Howard 4 fur plough.

The « Stock » self-contained 6-furrow motor plough.

The « Ivel » old pattern 20 H.P. agricultural motor with a Cockshutt « Kid Kangaroo » 3-furrow plough.

To each machine a portion of land in the same field was allotted. The land was substantially of identical character throughout the four portions. The depth of the ploughing was in all cases approximately inches and the quality of the work was fair. The consumption of fuel after running two hours was measured.

In making their award the judges made the question of first cost and economy of working an important factor. The other points on which the judging was based were: Acreage ploughed in a given time, quality and depth of work, weight on the land, fuel and oil consumption, ease of transport, simplicity of design and strength, accessibility and facility of repair, adaptability to other farm uses and ease of handling. For each point marks were awarded on a variable scale according to its relative importance. Full consideration was also given to interest on capital, depreciation, maintenance and repairs. In the results the points awarded were as follows:

« Universal »	357	« Stock »	276
« Ideal »	294	« Ivel »	158

The following table gives the principal results obtained at the trial:

	« Universal »	« Ideal »	« Stock »	« Ivel »
Price . . .	£ 267	£ 650	£ 1 050	£ 365
res ploughed in 2 hours .	1	1	2 ¼	¾
el consumed . . .	paraffin . 44 pints	—	—	36 pints
	petrol . 2 "	52 pints	—	5 "
	benzol . —	—	68 pints	—
st per day	£ 1 18s 0d	£ 2 12s 0d	£ 5 6s 4d	£ 2 0s 8d
st per acre	4s 9d	6s 6d	5s 10d	7s 8d

9 - **New Hand Drills** (1). — VON RÜMKE in *Deutsche Landwirtschaftliche Presse*, Year XXXI, No. 33, p. 409 + 1 fig. Berlin, April 25, 1914.

The writer points out the advantages of two hand drills (for one and two rows) and one machine for sowing single grains in holes, built by him and by H. Leidner.

The advantages of the drills consist in their continuous work, in their easy management and their suitability for all seeds and methods of sowing. They allow a very uniform distribution of seed, even with small quantities per unit of surface; they do not crush or otherwise injure the seed and they can be instantly emptied by tilting over. The two-

(1) See: No. 1207, B. Aug. 1912.

(Ed.).

row machine allows of the rows being from $3\frac{1}{4}$ to 16 inches apart and it is so constructed that the seed can flow into only one funnel if so required. The field to be sown does not require any other preparation than that which is usual for team-hauled drills, nor is any harrowing required after drilling.

The marker is especially suitable where grains have to be sown singly. With three or four assistants upwards of 50 000 seeds can be sown per day.

These machines will be found especially useful in plant-breeding establishments, in gardening and forestry, and in scientific institutions where varieties are tested, and in general in all cases in which continuous and perfect seeding is required. The prices of the machines are the following: - One-row drill £5 8s, the two-row drill £7 7s, and the marker & single-grain seeder £9 16s.

560 - **Fletcher and Becker's Fruit Grader.** - *The Implement and Machinery Review*, Vol. XXXIX, No. 464, p. 1072. London, December 1, 1913.

The grading of fruits by machinery ensures a more rapid and uniform separation than when this work is done by hand, but some machine graders are liable to damage delicate fruit. With this new grader (see fig. 3, facing p. 808), however, bruising seems to be impossible. Apples, tomatoes, gooseberries and similar fruit can be separated into four grades at the rate of two bushels a minute and cleaned at the same time.

Each grading surface is composed of indiarubber belting, in which suitable sized holes are punched, laced round two rollers, and three such units at varying heights form the bottom of the main trough of the machine. Any of these belts can be quickly removed and replaced by others having smaller or larger holes. The rollers carrying the belts are driven by chain and sprocket gearing actuated by the operator, who stands at the hopper end of the machine.

The fruit as it is carried along by each belt comes into contact with suspended cleaning brushes, which also help the separation, the smallest size falling upon the first packing table and the largest passing out at the far end of the machine.

The packing tables are made of canvas and held in strong wooden framing; their height may be easily regulated.

561 - **"Germania" Potato Esiccator with Oil Heating.** - *Maschinen-Zeitung*, Year 1, No. 4, p. 45. Berlin, February 15, 1914.

The Association of German Potato Dryers recently tested the two cylinder potato esiccator "Germania" at the potato flake factory at Löbnitz near Cöthen. According to Prof. Parow's report, the trial was very satisfactory.

The special character of this esiccator is that the cylinders are not heated by steam but by oil at a temperature of 250°C . (482°F .), heated in a special boiler, and then pumped into the cylinders. The work is quite free from danger, as the ignition point of the oil is 340°C . (734°F .) and neither the boiler nor the pipes have to bear any pressure. The return of the oil to the boiler is also very simple.

The whole plant, without woodwork and masonry, costs about £80. About £40 worth of oil is required.

162 - **The Manufacture of Agricultural Machines and Implements in Russia in 1911.** — *Landwirtschaftliche Maschinen u. Geräte*, Year 14, No. 13, pp. 15-22 and 40. Artern, Prov. of Saxony, March 28, 1914.

In 1912 the statistical division of the Bureau for Agricultural Machinery at St. Petersburg, considering it necessary to know the present state of the manufacture of agricultural machines and implements in Russia, collected material by enquiries addressed to manufacturers, to factory and plant Revenue inspectors, to the Customs Department and to others, and as now published a book on the subject under the title: "The manufacture of agricultural machines and implements in 1911 and their importation into Russia."

In spite of the great competition of foreign countries, the machine industry has developed of late years to such an extent that in 1911 it was in a position to place on the home market £6 502 400 worth of machines and implements, the output of factories, small workshops and private artisans being included in this sum. According to the enquiry, about 820 factories build agricultural machinery; of these 665 are situated in European Russia, 110 in Poland, 37 in the Caucasus and 8 in Siberia. Their total output amounted in 1911 to £5 320 017. Table I shows the number of factories and the value of the machines built by them.

From this table it will be seen that the agricultural machine industry is most developed in South Russia, in the so-called New Russia and in the northern regions. This is due, on the one hand, to the facilities for providing the raw material, iron and steel, and on the other to the demand for improved equipment in those districts.

The above sum of £5320 017 is distributed among the various groups of machines as follows:

TABLE II.

	£
Tillage implements	954 530
Sowing machines	804 500
Harvesting machines	1 312 321
Threshing machines	713 360
Cleaning and grading machines	239 796
Machines for preparing fodder	146 225
Gins and transmissions	298 053
Power motors	324 062
Other machines and implements and duplicate parts . .	527 170

£5 320 017

Among the tillage implements, ploughs represent, about three-fourths of the total value. They are built in almost every "government", but specially in Southern Russia, where they were already manufactured on a large scale in the seventies of last century. The total number of ploughs built in Russia in 1911 may be set down at 650 000. The exact number and value of machines and implements constructed by private artisans

TABLE I.

Territories and "governments"	Number of works	Value of output £
<i>Central agricultural territory:</i>		
Kursk, Orel, Rjasan, Tambov, Tula, Voronezh	73	341 825
<i>Middle Volga:</i>		
Saratov, Simbirsk, Pensa, Nijni-Novgorod, Kasan, Ufa	63	169 168
<i>Lower Volga:</i>		
Samara, Orenburg, Astrakhan	9	19 243
<i>New Russia:</i>		
Bessarabia, Kherson, Taurida, Yekaterinoslav, Don province	157	2 876 913
<i>South west:</i>		
Kiev, Podolia, Volhynia	68	170 866
<i>Little Russia:</i>		
Kharkov, Poltava, Chernigov	40	436 242
<i>Industrial district:</i>		
Vladimir, Moscow, Kaluga, Tver, Yaroslav, Kostroma	48	328 713
<i>White Russia:</i>		
Minsk, Moghilev, Vitebsk, Smolensk	47	47 050
<i>Lithuania:</i>		
Vilna, Kovno, Grodno	11	48 933
<i>Lake district:</i>		
Pskow, St Petersburg, Novgorod, Olonets	9	16 573
<i>Baltic provinces:</i>		
Livonia, Courland, Esthonia	39	286 634
<i>Urals:</i>		
Vyatka, Perm	100	94 945
<i>North:</i>		
Vologda, Arkhangelsk	1	—
In 50 governments of European Russia	665	4 831 121
<i>Poland:</i>		
Warsaw, Kalisz, Kielce, Lomza, Lublin, Pietrkow, Plock, Radom, Siedlce, Suwalki	110	437 088
<i>Caucasus:</i>		
Kuban, Stavropol, Terck, Tiflis, Erivan	37	43 455
<i>Siberia:</i>		
Tobolsk, Tomsk, Amur prov., Lake district	8	8 333
The whole of Russia	820	5 320 017

cannot be easily determined; still, from enquiries made, their value may be estimated at about £740 000. Besides this, a number of factories

and workshops mount and repair agricultural machines, for, which they also make a certain number of duplicate parts. The value of this kind of work may be estimated at about £444 066.

The grand total of the output of the Russian factories and workshops is therefore about \$6 502 400. But this is insufficient to meet the demands of the Russian farmers, who still import large quantities of agricultural machinery from abroad. According to the Customs returns in 1911 about \$119 124 worth of foreign machines and implements were imported and in 1912 about \$6 540 881. Among the imports of 1911, reapers, hay tedders and horse rakes figure for £2 524 621, threshing machines for \$610 907 and scythes, sickles and forks for £264 325.

The consumption of agricultural machines has risen during the last 30 to 35 years from £845 840 to £12 581 870. In order to promote still further the use of good agricultural machines and implements, about 20 years ago the Russian Ministry of Agriculture set aside an area of 24 acres, near the agricultural school of Eugenfeld, for the establishment of a permanent station for testing such machines. They are selected for trial by a special Bureau in St. Petersburg, which applies directly to foreign firms whose machines it wishes to test and informs them of the condition of the trials. This season most of the tests will deal with tillage machines: tractors, steam ploughs, etc.

3 - **The Trade in Agricultural Machines in France.** — COUPAN, G. in *La Vie Agricole et Rurale*, Year 3, No. 18, p. 469. Paris, April 4, 1914.

There being no available statistics as to the quantities of agricultural machines and implements made in France, an idea of the development of this industry can only be formed from the statistics of the imports and exports. The annexed diagram shows the rapid increase of the imports since 1895 and the slow rise of the exports.

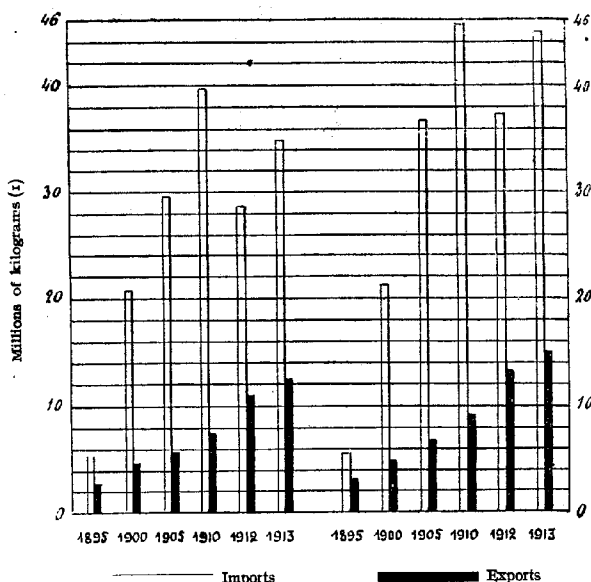
By far the greatest quantity of agricultural machines and implements imported into France come from the United States, namely from 55 per cent. in 1895 to 69 per cent. in 1912. The next most important country in this connection is the United Kingdom (37 per cent. in 1895 to 10 per cent. in 1912) followed by Germany, from 5 per cent. in 1895 to 10.5 per cent. in 1912.) As for the kinds of machine imported, mowers, reapers and binders occupy the first place. During the first 10 months of 1912 and of 1913 they amounted to about 70 per cent. of the total imports.

French machines are exported to many countries, chiefly however to the French colonies and protectorates.

French imports and exports of agricultural implements.

Gross weights.

Values.



- (1) 1 million kilos = 2 204 620 lbs.
 (2) 1 million francs = £39 648 16s 8d.

564 - Imports and Exports of Agricultural Machines and Implements into and out of Germany in 1913. — *Maschinen-Zeitung*, Year 12, No. 4, p. 42. 1 February 15, 1914.

The following table shows the numbers and value of the most important agricultural machines imported into and exported from Germany during the year 1913:

	Imports		Exports	
	No.	Value £	No.	Value £
Threshing machines	526	—	20 189	4
Iron ploughs	5 362	—	292 610	6
Ploughs for power motors	268	—	326	—
Mowers and reapers	50 638	1 176 468	6 508	—
Milk separators	33 055	133 803	45 892	1
Machines for breweries, distilleries, and sugar, lime, clay and cement factories	—	24 510	—	18
Other agricultural machines	—	133 803	—	15

- Review of Patents

Tillage machines and implements.

- ria, 64 488. Toothed wheel gear for internal combustion ploughing machine.
64 489. Spur wheel for steam plough traction engines, motor ploughs and the like.
64 821. Hoing apparatus.
ium, 262 502. Plough mouldboard with rollers and conveyers.
ice, 464 667. One-way plough with metal beam.
456 191. Motor plough.
464 058. Motor tractor plough.
464 232. Attachment for motor ploughs and the like.
463 000. Double gang plough in which the turning, fixing and adjusting is done automatically by the team.
463 001. Motor plough.
many, 272 006. Apparatus for driving agricultural machines by electric power.
272 050. Hoe for agricultural motors.
272 204. Driving wheel for motor ploughs in which skidding is prevented by radially moveable spuds worked by an excentric.
272 538. Hoing machine.
272 539. Hand tilling implement.
272 540. Device for simultaneous and uniform raising and lowering of plough shares in motor ploughs with revolving beam.
ngary, 61 852. Plough drawn by electric power.
61 947. Tilling machine.
62 053. Motor ploughing apparatus.
62 192. Hoing machine.
ily, 130 979. Ploughing machine.
132 899. Improvement in harrows.
134 585. Improved coulter for ploughs.
135 964. New non-skidding wheel for ploughing and other agricultural machines.
137 552. Cultivator.
tzerland, 63 482. Device for adjusting the gage of plough wheels while working.
63 484. Tilling implement.
63 761. Apparatus for machine tilling.
63 762. Tilling machine with motor driven implement shaft.
ited Kingdom, 26 343. Flexible arms for agricultural implements.
26 500. Ploughs.
26 593. Cultivating apparatus.
ited States, 1 087 620. Motor driven device for tilling the soil.
1 088 788. Folding harrow.
1 089 072. Disk furrow opener.
1 089 325. Soil pulverizer.
1 089 351. Automatic hoe.

Manure distributors.

- nce, 463 128. Spreading device for manure distributor.
many, 272 051. Manure distributor with roller.
ngary, 62 014. Manure spreader.
ited Kingdom, 25 773. Manure and seed drills.
ited States, 1 090 293. Fertilizer distributor.
1 090 356. Fertilizer distributor.

Drills and sowing machines.

- Austria, 65 008. Furrow opener for drills.
 France, 462 978. Machine for making holes in the ground in which to plant potatoes.
 464 584. Portable sowing apparatus.
 Hungary, 61 803. Potato planting machine.
 61 937. Drill and manure spreader.
 Italy, 136 008. Rotary sowing machine.
 138 540. Apparatus on wheels for thick sowing.
 Switzerland, 63 485. Sowing and manure spreading machine.
 United Kingdom, 25 700. Seed drills.
 United States, 1 087 211. Combined seed planter and manure distributor.
 1 087 319. Seeder and cultivator tooth.
 1 089 458. Corn planter.
 1 089 893. Corn planter attachment.

Reapers, mowers, etc.

- Austria, 64 620. Motor mower.
 France, 463 666. Side delivery rake.
 463 624. Lawn mower.
 463 805. Motor chassis for mowers, reapers and binders of all systems.
 463 398. Mowers with fore-carriage.
 464 454. Improvements in side-delivery rakes.
 Hungary, 61 872. Hand reaper.
 Italy, 134 347. Sheaf opener.
 134 603. Motor mower.
 135 120. Mower, reaper and motor car with reversible motion.
 United States, 1 087 455. Corn harvester.
 1 090 029. Attachment for binders.
 1 090 246. Motor harvester.
 1 090 371. Corn gatherer and husker.
 1 090 747. Tobacco harvester.

Machines for lifting root crops.

- Belgium, 262 745. Improvements in topping and lifting machines for beet and oil roots planted in rows.
 France, 463 631. Machine for topping and lifting beets and similar roots.
 463 836. Machine for topping and lifting beets and similar roots.
 464 022. Beetroot lifter.
 Hungary, 61 716. Potato lifting machine.
 61 927. Delivery wheel for potato lifter.
 62 097. Two-rowed beet lifter.
 Italy, 135 987. Potato lifting machine.

Threshing and winnowing machines.

- Belgium, 262 695. Shaker for threshing machine.
 France, 464 634. Sheaf elevator.
 Hungary, 62 130. Cereal cleaner.
 62 248. Grain sieve.
 Italy, 136 041. Threshing and husking machine for wheat.
 Switzerland, 63 487. Apparatus for separating stones and earth from cereals.
 United Kingdom, 26 055. Threshing machines.
 26 433. Separating wild oats from wheat etc.
 United States, 1 087 338. Corn husking machine



Fig. 1. Fletcher and Becker's fruit grader (see No. 560).



Other agricultural machines and implements.

- Austria, 64 616. Groat mill.
65 010. Drainage and ditching machine.
- Nance, 462 938. Milking machine.
463 049. Apparatus for milking cows.
463 625. Attachment for churns for getting rid of the butter milk.
463 846. Improved sharpener for the knives of chaff cutters and similar machines.
463 851. Apparatus for charging compressed air sprayers.
463 895. Device for unfastening animals in stables.
464 205. Apparatus for protecting crops from frost.
465 301. Cone-shaped attachment for nozzles of sprayers.
- Germany, 272 026. Motor straw elevator.
272 202. Apparatus for singling plants sown in rows.
272 205. Ditching plough.
- Hungary, 62 046. Beet pulp press.
62 130. Cereal cleaner.
- Italy, 130 970. Escicators for rice, maize, pomace, etc.
131 908. Spherical elastic valve for horizontal tube of sprayers.
134 451. Improved sulphurer.
135 549. Floating weeding machine.
135 964. Apparatus for driving automatically any sprayer mounted on wheels.
136 215. Portable continuous action hydraulic press.
- Netherlands, 65 489. Device for introducing honeycomb frames into or removing them from hives.
63 517. Process for freeing peat from water.
63 565. Apparatus for extracting the juice of fruit by means of steam.
63 759. Centrifugal separator.
63 764. Straw baler.
63 767. Apparatus for the destruction of pests such as flies, by means of electricity.
64 646. Machine and process for the preparation of farmyard manure.
64 702.4. Apparatus for grading and cleaning grain groats, grain, etc., by means of static electricity.
64 705. Process and apparatus for the dry preservation of eggs.
- United Kingdom, 25 000. Cow milkers.
25 641. Spraying nozzles.
25 767. Butter churn, grinder and worker.
26 032. Machine for treating oil palm fruits.
26 065. Sharpener for knives of chaff cutter.
26 322. Driving gear for chaff cutters.
26 446. Instrument for tapping rubber trees.
- United States, 1 087 309. Flax puller.
1 090 709. Machine for heading Kafr corn.

566. - **The Shower-Bath System of Sheep Dipping.** — *The Implement and Machinery Review*, Vol. XXXIX, No. 468, p. 1660. London, April 1st, 1914.

The accompanying illustration shows the new shower-bath system of sheep dipping, which appears to be finding favour in Queensland. It consists of a shed 40 ft. long by 12 ft. wide, the roof of which is of flat perforated iron sheets. The dip is pumped by a 3 in. centrifugal pump

from a tank to the roof and falls through the perforations on to the 200 sheep beneath, the shower lasting about seven minutes. The roof edges are turned up to prevent the dip running off and the sides of the shed are enclosed to obviate the blowing about of the dip. There are about 35 hole to the square foot.

This method is proving entirely satisfactory, the cost in one case being stated to be $\frac{1}{2}$ d per head. One thousand sheep per hour can be dipped without undue haste by four men.

RURAL ECONOMICS.

567 - **The Economic Importance of Beet Growing.** — SAGAWA, B. in *Archiv für exakte Wissenschaftsforschung*, Vol. 6, Part I, pp. 157-209. Jena, 1914.

The writer examines and discusses the importance of beet growing, and investigates the soundness of the frequently recommended principle: "extensiv organisieren und intensiv kultivieren" (cultivate intensively in extensive farming) which tends to increase the growing of forage plants at the expense of beets.

He mentions first the results of some investigations into the labour required for growing beets by WATERSTRADE, WERNER, DETTWEILER and LANGENBECK, wherein it is shown without exception, that the amount of labour in a farm increases with the proportion of the land under beets. On the other hand the results do not agree as to the difference of the amount of labour required in the most intensive and the most extensive farms. Before diminishing the acreage of beets in favour of forage crops in order to overcome the difficulty of procuring labour, it is necessary to have a clear idea of the consequences of such a change and of the other economic factors involved in beet growing, such as its profitableness, its value as a source of forage and its effect upon the utilization of labour.

All investigations made up to the present have shown that beet growing is one of the most important elements of profits of farms in arable districts. In part 180 of the *Arbeiten der Deutschen Landwirtschafts-Gesellschaft* (Transactions of the German Agricultural Association) LANGENBECK examined the effect of the acreage of root crops on farming conditions in 42 farms and came to the conclusion that the increase of root crops leads to the increase of live stock, to the increase of the value of the dead stock, to the increase of the outlay on artificials, concentrated foods, and salaries and to the increase of the returns from animal and vegetable products, of the net returns and of the capital invested. Part 214 of the *Arbeiten der D. L. G.*, dealing with farming in Silesia, as well as some previous work of the present writer on the profitableness of root crops (1), lead to the same results. The statistics of the Silesian Chamber of Agriculture show that when the farms are arranged according to the percentage of their area devoted to beets the same conclusion is reached. (Table I).

(1) See No. 407, B, April 1913.

TABLE I.

Root crops per cent of area	Total value per acre	Gross returns per acre	Outlay per acre	Net returns per acre	Interest per cent
	£ s d	£ s d	£ s d	£ s d	
1910-1911					
under 15	33 2 6	4 14 5	4 17 1	5 2	0.8
20	40 13 4	6 1 5	5 3 7	1 1 0	2.6
25	43 8 11	7 4 5	5 17 5	1 12 6	3.7
30	47 7 11	9 7 8	7 0 1	2 11 2	5.2
above 30	37 18 8	12 10 5	9 9 4	3 2 8	5.5
1909-1910					
under 15	44 16 8	5 4 0	5 5 1	15 6	1.7
20	34 14 4	4 7 11	14 14 4	1 3 10	3.4
25	14 17 4	7 1 7	5 14 4	1 14 6	4.2
above 25	51 19 6	10 6 8	8 10 7	2 16 8	5.5
1908-1909					
under 15	45 12 6	5 9 1	5 0 0	7 11	0.9
20	37 9 11	5 15 6	5 5 6	17 1	2.3
25	38 12 11	6 19 4	5 15 6	1 7 0	3.5
above 25	51 11 7	9 16 10	7 13 11	2 11 7	5.0

In their work on the returns of Moravian peasant farms (*Ertragsfähigkeit der mährischen Bauernbetriebe*, Brünn 1911) HOWARD and OSTERMAYER come to the same conclusion: that the rate of interest yielded by the capital invested depends directly upon the acreage of the root crops.

The question of the consequences of substituting forage for beet crops can only be correctly solved by a careful comparison of the amount of forage produced by the two crops. The writer makes this comparison, calculating the cost of the forage supplied by both according to their technical value, and using the values of HOWARD and OSTERMAYER for the purpose. He assumes the leaves of beetroots to be one third of the crop, that the ratio of grain to straw is 1:2 in wheat and rye, 1:1.5 in oats and 1:1.33 in barley, and finds that the cost of production of one hundredweight of food units is as follows:

	According to Howard	According to Ostermayer
	£ s d	£ s d
Winter wheat	6 10	7 5
Winter rye	7 1	8 0
Barley	6 8	6 7
Oats	7 6	7 4
Beets	4 4	3 8
Mangolds	—	8 10
Potatoes	7 11	9 2
Clover hay	—	4 8
Meadow hay	—	4 10

According to the above, beets produce the cheapest food units, cheaper than meadows and clover leys. But the question arises whether beets should be compared to hay or rather to fresh clover and grass, as in making hay a considerable loss of food units takes place and the cost of production increases. But as it is generally impossible to feed all the clover and meadow grass in its fresh condition, the writer is of opinion that the comparison of beets and forage plants should not be made between the former and hay, but between the beets and the green food, but between the food value of pure green food, part hay on the one hand and of beet leaves in the state in which they are utilized on the other. Not the quantity at the time of the harvest but the available quantity in the condition in which it is fed should be calculated, because a certain loss of food units takes place during the storage of roots and leaves. On this plan, the writer has calculated the cost of production of forage, in the state in which it is fed, from twelve yearly accounts of several Silesian farms in different years, and determined the price of one hundredweight of food units in:

	s	d
Clover	3	0
Lucerne	3	2
Beets	4	4
Meadow grass	4	9
Mangolds	7	10
Potatoes	7	10 $\frac{1}{2}$

from which it appears that the food unit in beets is dearer than in clover and lucerne, but cheaper than that of meadow grass.

The exclusive consideration of market prices leads to erroneous conclusions, as does the neglect of the unmarketable products produced on a farm for the farm itself must be considered as the market. The valuation on a physiologico-economical basis (1) is also erroneous, because by this method the price of the starch unit delivered at the farm is taken as basis, and then the unmarketable products are given a value plus cost of carriage, while the marketable ones get a value minus the same. But apart from this is a mistake to make the starch unit the basis of the price of foods which are not sold in the condition in which they are fed, for this way of valuation though correct from the physiological point of view, is unsound from the economic point of view, because the unmarketable field products can only be made marketable by means of live stock.

The profitability of beet growing is much influenced by the valuation of its by-products. If beet leaves could be sold on the market, their value on the farm would be the market price minus cost of carriage. If, therefore, their value is to be calculated from the market prices of the marketable foods, from every hundredweight of the farm forage the cost of transport per cwt. of marketable food must be deducted; the actual cost of carriage of the marketable food must not be set off against the total quantity

(1) See No. 166, B. Feb. 1914.

unmarketable produce. But for beet leaves it does not seem advisable to take the marketable foods as basis of their valuation, on account of the dependence of beet growing and live stock for the production of stable manure and forage. Beet leaves must therefore be sold to the live stock which leaves a margin of profit for the beet account. This intimate value of farm by-products varies according to food units, or per unit in marketable foods minus the cost of carriage per hundredweight, and the minimum value or manure value plus cost of storage. The writer then discusses the intimate connection between live stock and beet growing for the utilization of farmyard manure, and shows that from his point of view also a substitution of forage crops for beet would be detrimental to buying dearer forage and getting a lower value for the farmyard manure, and would result in a decrease rather than an increase in the return from the live stock and consequently from the whole farm, provided the growing of beets had not yet exceeded its most profitable limits. With the increased acreage of beet, the utilization of labour improves. The writer proves this by classifying the farms which send their books to the book-keeping office of the Silesian Chamber of Agriculture according to acreage devoted to beets, and calculates the ratio of outlay on labour to gross returns (Table II).

TABLE II. — *Wages in percentage of gross returns.*

Year	Acreage in root crops				
	less than 15 %	15-20 %	20-25 %	25-30 %	above 30 %
1	39	35	31	28	26
10	41	36	32	27	23
20	35	36	31	27	60
Average . . .	38	36	31	27	23

The larger the relative acreage of root crops the smaller the outlay on labour required for the same gross returns. This result is due to the well known fact that with increasing intensity of farming labour diminishes in relation to the capital invested. The higher absolute outlay on labour is offset by the increasing profits of the farms, the means of which for the four years amount to 1.1, 2.8, 3.8, and 5.2 per cent. respectively for the four groups.

The same results are obtained from farms under the book-keeping control of the D. L. G. using LANGENBECK's and OSTERMAYER's figures. In order to show that these results are not due to the improvement in the quality of the soil and in the economical conditions of the beet farms rather than to the increase of root crops, the writer shows that by grouping the farms according to their increasing total value, the amount of labour employed in the D. L. G. farms shows no difference, that the figures of the beet farms show an increase in the amount of labour employed but

that the increase is quite insufficient to account for the fall of the with the increased acreage of root crops.

The statement that beet growing is often pushed beyond its profitable limits is not confirmed by the results of the accounts, which show that the interest on the capital invested still gives an increase when root crops attain upwards of 35 per cent of the total acreage, notwithstanding the fact that the proportion of net returns to gross returns factor "value according to returns" (Ertragswert) appears to reach its highest limit with about 30 per cent. of the total acreage under root crops. In order to determine the optimum limit of any crop which has reached its ultimate profitable limit of outlay, it is not enough to consider only the absolute value of the net returns or the ratio of outlay to gross return, but rather the rise or fall of the rate of interest on the total capital. The figures calculated on these lines for the D. L. G. farms show that root crops reach the optimum limit of profitability and in the use of capital at about 60 per cent., while root crops attain this same limit at about 30 per cent. with regard to the use of labour but not with regard to the highest rate of interest. It follows that such districts as do not have especially suitable conditions for extensive forage crops on account of their physical and natural conditions should only devote a relatively small percentage of their area to these crops.

568 - **The Consumption of Artificial Manures in Intensive Agriculture.** - H. H. in *Landwirtschaftliche Zeitschrift für die Rheinprovinz*, Year 15, No. 16, pp. 11-12. Bonn, April 17, 1914.

One of the most valuable means of judging the degree of intensity of the cultivation of a farm is a knowledge of the kind and amount of artificial manures used on it; thus the average outlay on artificial manures in the year 1913 on 36 farms in the Russian Baltic provinces was 2s 6d per acre of cultivated land, on 145 farms in East Prussia 7s 4d, and on 18 intensive farms in the Rhine province £1 5s 4d per acre. These figures afford a better indication of the degree of intensity than any other item of expenditure.

In the total outlay for the Rhine province, nitrate of soda and superphosphate of ammonia amount to 6s 5d, "Ammoniaksuperphosphat" (superphosphate of ammonia) to 12s 10d, superphosphate and basic slag to 2s 4d, potash salts and kainit to 2s 5d, and sulphate of ammonia to 1s 4d. If these figures be classed according to the percentage of various elemental plant nutrients, it will be found that nitrogen represents about 60 per cent., phosphoric acid 25 per cent. and potash about each 15 per cent.

The two principal sources of nitrogen are farmyard manure and artificial manures. The question of the best proportion in which these two should be used is of great importance with regard to the profitability of the farm. As the number of live stock kept increases, the necessity of supplying nitrogen in the form of artificial manures decreases, as is shown in the results of the accounts of the land farms which are divided into two groups according to the amount of live stock kept, with the following results (Table I):

Groups	Number of farms	Live stock per acre		Outlay for artificials per acre									
		Total	Cattle	Total	Nitrate of soda and sulphate of ammonia	Superphosphate of ammonia	Superphosphate and basic slag	Potash and kainit	Lime				
		£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d		
I	9	8 1 1	4 9 8	1 1 0	0 5 8	0 10 10	0 1 11	0 1 11	0 0 8				
II	9	5 19 5	2 11 12	1 9 7	0 7 1	0 14 11	0 2 11	0 2 12	0 1 11				

The outlay on artificials is much greater in group II than in group I and especially is this the case for nitrogen. The gross and net returns are very similar in both groups, as the difference in the amount of live stock is not large. If, however, farms are taken where the difference is greater, the influence of the live stock on the amount of fertilizers purchased, especially of nitrogen, as well as on the profitability of the farm is more evident. The writer has taken from the *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 130, the figures relating to 20 sugar-beet farms in Saxony, 10 of which keep much live stock and the other 10 only a limited quantity, other conditions being equal. It appears that the first group, which keeps 31.56 units of live stock per 100 acres buys 337 lbs. per acre of nitrate of soda and sulphate of ammonia annually, while the second group, which keeps only 12.54 units per 100 acres, consumes every year 11 lbs. per acre. The consumption of «Ammoniaksuperphosphat» is approximately equal, viz. 301 lbs. per acre in the first group and 298 lbs. in the second. The net returns are £4 4s 11d per acre in the first group and 12s 5d in the second. The above figures prove clearly that the net profits are connected with the quantity of live stock kept on the farm and increase with it. The writer is therefore of opinion that in every farm where large quantities of nitrogenous fertilizers are bought regularly, it should be ascertained whether the amount of live stock could not be increased and the amount of purchased fertilizers correspondingly decreased.

AGRICULTURAL INDUSTRIES.

- **Determination of the Viscosity of Milk as a Means of Detecting the Addition of Water.** — KOOPER, W. D. (Communication from the Laboratory of GARNER & CO. LTD., Leipzig) in *Milchwirtschaftliches Zentralblatt*, Year 43, Part 7, pp. 169-179 and Part 8, pp. 201-208. Hanover, April 1 and 15, 1914.

The writer examined 50 different mixed milks, with the object of investigating the question of utilizing the viscosity of milk as a means of detecting the addition of water. The fat content and specific gravity

were determined at the same time by the Gerber and lactometer tests respectively, and the total dry matter was calculated from these values by Fleischmann's formula. The viscosity was determined by means of a specially constructed burette-shaped apparatus. This was first filled with distilled water, then with milk; for both, the time required for the outflow of 10 cc. was observed.

$$\text{Viscosity constant, } V = \frac{\text{outflow of milk, time in seconds}}{\text{outflow of water, time in seconds}}$$

In order to get comparable results, the tests must be carried out at a uniform temperature, differences of 0.5° C. (0.9° F.) having a perceptible effect, and the bore of the outlet must be adjusted so that the outflow be neither too fast nor too slow. The milk must be thoroughly well mixed before being poured into the burette, without subjecting it to too violent shaking which might cause a change in the natural viscosity of the liquid. The time required for the outflow must be determined with precision to within one-fifth of a second.

A high viscosity constant is usually associated with a high fat content but the rule is not infallible, nor is the ratio of the specific gravity to viscosity constant more reliable. On dividing the average viscosity constant (1.588) by the average dry matter of the milk (11.472 per cent.), the factor 0.1384 was obtained, and if there be any constant relationship whatever between viscosity and dry matter content, the dry matter of any one sample (or T) should be given by the formula :

$$\frac{V}{0.1384} = T$$

On comparing values thus obtained with those obtained by using the Fleischmann formula for the 50 samples investigated, it appeared that the greatest divergence between the two methods amounted in one case to 0.36 per cent. All the other samples showed smaller differences, so that the writer concluded that a direct relationship existed between variations in the viscosity and the dry matter content of milk.

In using the viscosity constant for detecting the addition of water to milk, experiments showed that under certain conditions watered milk can yield the same viscosity constant as unadulterated milk, in which case the value obtained for T is too high; the greater the amount of water added to the milk the greater is the difference between the real and calculated value for dry matter, owing to the fact that the watering causes the amount of dry matter to diminish more rapidly than the viscosity constant. If a milk for instance with 11.472 per cent. of dry matter and a viscosity constant of 1.588 be mixed with an equal quantity of water, the percentage of dry matter would be reduced to $\frac{11.472}{2} = 5.736$; but

the viscosity constant would only be reduced to about $\frac{1.588 + 1}{2} = 1.294$.

From this :

$$T = \frac{V}{0.1384} \sqrt{\frac{1.294}{0.1384}} = 9.349 \text{ per cent.};$$

that is, the difference between the real and calculated values for the dry matter would be:

$$9.349 - 5.736 = 3.613 \text{ per cent.}$$

The difference between the amounts of dry matter determined by the two methods therefore affords an easy and rapid way of ascertaining whether milk has been watered, and if so to what extent. The writer recommends that the question be further investigated.

o - **Biorized Milk** (1). — KLUNKER, chief physician to the Institute of Hygiene at the University of Jena, in *Molkerei Zeitung*, Year 28, No. 33, pp. 625-626, No. 34, pp. 639-640, Hildesheim, April 29, May 1, 1914.

The above paper is a preliminary communication of an investigation of LOBECK'S milk sterilization process, carried out at the Institute of Hygiene, University of Jena, with an experimental apparatus capable of treating 2.64 gallons per hour. Samples of biorized milk from Leipzig, Chemnitz and Düsseldorf, where the process is in use, were sent for comparison, and the results obtained are as follows:

1. The whole apparatus is easy to handle, to dismount, to clean and to disinfect. The daily initial loss of milk is very small.
 2. The biorized milk (called by LOBECK "enzyme-milk") is equal in colour, appearance, smell and taste to the best raw milk.
 3. This milk is somewhat less easily skimmed than raw milk, but the temperatures employed, viz. 131 and 135° F., the difference is so small that it would be imperceptible to consumers. Equally good results can only be obtained with heated milk if the temperature be kept low 113° F. and the heating be continued for half an hour; no milk sterilized in any other way approaches biorized milk in this respect.
 4. The original enzymes (oxydases) of natural milk are not influenced by biorization; the milk proteins undergo no change. On the other hand coagulation proceeds more slowly but is not weakened.
 5. Biorization causes such a decrease in the germ content that the keeping quality of the milk is more than doubled. As moreover the heating to 131 and 135° F. does not destroy the lactic acid producers, there is no danger that the milk will be spoiled while on sale by the prevalence of spore-forming bacilli. Biorized milk can therefore compete with fresh, newly milked raw milk as food for babies.
 6. Disease-producing germs, such as typhus, paratyphus, diarrhoea, cholera and diphtheria bacilli, are destroyed with absolute certainty. The destruction of the tubercle bacilli is less certain, but experiments seem to indicate that they do not resist the treatment.
- The new process would appear to mark a distinct forward step towards supplying a hygienic, wholesome milk to the public.

(1) See: No. 743, *B.* June 1913; No. 1190, *B.* Oct. 1913; No. 1389, *B.* Dec. 1913.

(Ed.)

571 - **The Effect of Certain Dairy Operations upon the Germ Content of Milk.** -

HARDING, H. A., RUEHLE, J. K. etc., *New York Agricultural Experiment Station, Bulletin* No. 365, pp. 197-233. Geneva, N. Y., August 1913.

Bacterial counts were made in milk samples produced under various conditions of hand-milking. Neither plastering nor whitewashing the byre, nor clipping the udder and flank of the cows, nor the use of a vacuum machine for cleaning the cows preparatory to milking, seemed to have any effect on reducing the bacterial content of the milk; in fact the opposite effect was usually observed. A series of tests carried out on samples drawn from the milking pail, from the cooler, and after final straining, indicated that the germ content of the milk was not increased by the handling it received on the farm subsequently to the milking operation.

572 - **The Origin of Some of the Streptococci Found in Milk.** -

ROGERS, L., and DAHLBERG, A. O. (Bureau of Animal Industry) in *Journal of Agricultural Research*, Vol. I, No. 6, pp. 491-511. Washington, D. C., March 1914.

A collection of cultures of streptococci was made, of which 42 were isolated from normal milk, 51 from infected udders, 114 from bovine faeces and 39 from the mouths of cows. These were all subjected to a large number of tests and tabulated according to their behaviour on gelatine and in media containing dextrose, lactose, saccharose, raffinose, starch, inulin, mannit, glycerin, dulcitol and adonitol. The cultures fall into groups according to the nature of the material from which they were originally isolated.

573 - **Improvement of Damaged Wines and Spirits.** - ZWEIFLER, F. in *Allgemeine Weinzeitung*, No. 18, pp. 185-186. Vienna, 1914.

The writer carried out some experiments on the improvement of damaged wines at the Agricultural Experiment Station of Marburg (Styria) during which the following results were obtained.

1. A turbid highly coloured wine with a musty odour and taste was treated with sesame oil, but ineffectually. On increasing the dose of oil the smell of the latter was communicated to the wine. On adding 0.16 oz. of Eponit (1) per gallon of wine and filtering it after six days, the wine became light coloured and clear, and tasted clean.

2. Another wine that had become dark brown was treated with 0.00 oz. of sodium bisulphite, 0.0096 oz. of gelatine and 0.008 oz. of tannin per gallon, with the result that the colour became clear and the wine kept well. Equally good results were obtained by using 0.064 oz. of Eponit and 0.008 oz. of sodium bisulphite alone.

3. A sour turbid wine with a taste of the cask (total acidity 12.7 per thousand) on being treated with 0.24 oz. of precipitated carbonate of lime, 0.0192 oz. of gelatine and 0.016 oz. of tannin per gallon, became clear and mild and pleasant to the taste. Sesame oil had no other effect than that of imparting its smell to the wine.

(1) "Eponit" is a vegetable charcoal, a new clarifier which has given good results. It is sold by the AKTIEN GESELLSCHAFT DER OESTERREICHISCHEN CEREN FABRIK, late UJEHLY AND Co., of Stockerau near Vienna.

4. White wine made with red grapes was decoloured in order to blend it with another white wine. In one case 0.12 oz. of Eponit per gallon was sufficient, while another wine required 0.16 oz. per gallon.

5. Two plum brandies which had become black were clarified, one with tannin and gelatine, and the other with skimmed milk; the results were imperfect in both cases, while 0.368 oz. of Eponit, though working slowly, rendered the brandy perfectly clear and its taste quite clean. An equally good result was obtained by adding water to the brandy and redistilling it.

PLANT DISEASES.

GENERAL INFORMATION.

- 574 - Decree Placing *Mytilaspis citricola* (= *Lepidosaphes beckii*) among Notifiable Insects in Uruguay. — *Revista de la Asociación rural del Uruguay*, Year XII No. 12, p. 883. Montevideo, 1913.

At the request of the "Defensa Agrícola", and on evidence of damage caused by this insect to orange plantations in certain districts, the President of the Republic issued a decree, dated October 25, 1913, that *Mytilaspis citricola* (*Lepidosaphes beckii*) should be classed as an insect injurious to plants according to art. 7 of the law of October 21, 1911.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

- 575 - Observations and Researches on "Dörrfleckenkrankheit" (Dry spot Disease of Oats. — HILTNER, L. in *Praktische Blätter für Pflanzenbau und Pflanzenschul*. Year 12, Part 3-4, pp. 28-41, 1 fig. Stuttgart, March-April 1914.

A disease of oats generally called "Dörrfleckenkrankheit" has been observed in various districts in North Germany during recent years and has frequently appeared in Holland, Denmark and Sweden. The leaves develop normally at first, but fairly early lose their turgescence at the bends; the wilted portions soon change colour and perish. If the disease appears when the plants are young, as is often the case, the yield of the crop is greatly reduced, since many of the panicles do not emerge from their sheaths.

The disease has been attributed either to a fungus, *Scolecotrichum graminis*, or to root nematodes, or to the frit fly (*Oscinis irid*). The majority of observers, however, consider it due to unfavourable soil conditions, particularly the percentage of lime.

Pot culture experiments carried out by the writer (Director of the Agricultural Botanical Station of Munich) show that: 1) the disease apparently does not occur on compact clay soils; 2) it appears in cultures

of ordinary garden soil containing lime, without direct addition of lime; 3) treatment of this soil with carbon disulphide does not prevent the outbreak of the disease; 4) no disease appears on soil treated with quicklime and carbon disulphide, but carbonate of lime and carbon disulphide are without effect in checking the disease. The effect of the quicklime in combination with carbon disulphide is accounted for by its action on the increased ammonia produced after the treatment with carbon disulphide, resulting in increased nitrification and the formation of calcium nitrate.

In field cultures the disease increased considerably after abundant rain; this causes the formation of bicarbonates of soda and potash by double decomposition of alkaline salts with the carbonate of lime in the soil.

Water cultures lead to the conclusion that the disease is not caused by the presence of lime itself, but by the resulting decomposition products formed either in the soil or in the leaves of the oats. The researches show that: 1) in nutritive solutions containing monopotassium phosphate, normal development of the oat and other plants is impossible when the solution is made with un-neutralised tap-water containing lime; chlorosis develops rapidly owing to the alkalinity of the surface-film of the solution, and the functions of the roots are checked; 2) in Knop's solution made with Munich tap-water neutralised with sulphuric acid, the oat plants develop relatively better, but the leaves are subject to the disease; the chemical decomposition causing the alkaline reaction evidently takes place in the leaves in this case; 3) since the addition of monopotassium phosphate to garden soil containing lime can cause the development of the disease in oats, it is concluded that as in the case of water cultures, the appearance of the disease is determined chiefly by the alkaline decomposition products formed in particular by the action of the bicarbonate of lime.

The different varieties of oats show varying degrees of resistance to the disease. Pot cultures have shown that the variety *Leutewitzer Yellow* is more resistant to the frit fly than *Fichtelgebirg*, and that it remains free from disease in garden soil rich in lime, whilst *Fichtelgebirg* is badly attacked. In soils poor in lime the disease does not appear in either variety. The writer considers the yellow varieties less susceptible to the metabolic disturbances which give rise to the disease. The fungus *Scolecotrichum* appears later on all the diseased plants, but it cannot be the cause of the disease since it is only developed to any considerable extent on certain types of soils.

The functional disturbances of the leaves may be prevented by spraying with a solution of iron salts. A diseased culture of *Fichtelgebirg* oats was effectively cured after four sprayings with $\frac{1}{2}$ to 2 per cent. solutions of iron salts. Tartrate of iron gives the best results.

It has also been found that oats which have become chlorotic owing to the presence of alkaline substances in the nutritive medium, or which suffer from the disease owing to the formation of injurious alkaline products in the leaves, can be cured by spraying with salts of iron. This would explain the satisfactory development of oats which is often noted after spraying for wild radish with sulphate of iron.

The writer has also determined the identity of the disease known as "Hafer sucht" in the Bavarian Alps, and "Holsternische Haferkrankheit" or "Moorkoloniale", with "Dörrfleckenkrankheit". The research are being continued to determine the effects of acid and alkaline fertilizer

- 576 - **The Presence of Endocellular Fibres in the Tissues of the Vine and other Dicotyledons** (1). — MAMELI, EVA in *Atti dell'Istituto botanico dell'Università di Pavia*, Series II, Vol. XVI, pp. 47-65, plate VIII. Milan, 1914.

In this summary the writer fully confirms her preceding observations (2)

The presence of endocellular fibres is frequent, not only in the vine affected by bramble-leaf (roncet), but also in healthy ones (86 per cent. vines grown in districts hitherto free from bramble-leaf and showing no exterior symptoms of this disease or of decay, may contain these endocellular fibres even in the two-year-old canes.

Between healthy vines and those suffering from bramble-leaf, there is no difference at all either in the form or in the frequency of the fibres; these may be rare or wanting altogether in both.

The formation of the fibres cannot be attributed to falls of temperature, because their presence has been ascertained by the writer in vine and other plants grown for several years in hot-houses.

The writer has found these fibres in *Vitis vinifera* L. and *V. heterophylla* Thunb., as well as in nineteen other dicotyledonous plants belonging to the most different families, so that their presence has no connection with any pathological condition of the plant which contains them. Their origin and function of the endocellular fibres are in all probability mechanical.

BACTERIAL AND FUNGOID DISEASES.

- 577 - **Phytopathological Observations in the Grand Duchy of Baden, 1913.**

WAHL, C. von and MÜLLER, K. in *Bericht der Hauptstelle für Pflanzenschutz in Baden an der Gossheerzogl. landwirtschaftl. Versuchsanstalt Augustenburg für das Jahr 1913* pp. 70, + 5 figs., append. I and II. Stuttgart, 1914.

A list is given of the cultivated plants and their pests observed during 1913.

Phylloxera (*Phylloxera vastatrix*) was recorded for the first time in the Grand Duchy of Baden. *Conchylis ambiguella* caused serious damage whilst the vine mite (*Phyllocoptes vitis*) and the vine tortrix (*Tortrix pilana*) have diminished.

American gooseberry mildew (*Sphaerotheca mors-uvae*) has spread everywhere.

Experiments on the destruction of meadow saffron (*Colchicum autumnale*) have been started; the seeds are not distributed by irrigation.

(1) See No. 480, B. May 1914.

(2) See No. 1207, B. Oct. 1913 and No. 289, B. March 1914.

(Ed.).

(Ed.).

since they sink in water, but apparently by means of hay seeds; in 4 ½ lbs. of hay seeds 790 of these seeds were found.

Experiments on protective measures against plant pests.—Comparative trials of the fungicidal action on vine mildew (*Plasmopara viticola*) have been made with certain commercial fungicides and Bordeaux mixture. "Cerdidimsulfat", "Malacidschwefel" and "Laykoschwefel" were tried and found inferior to Bordeaux mixture. They were particularly useless against mildew in 1913, when the weather was very favourable to the disease.

Applications of 20 per cent. solutions of sulphate of iron were used against the "Grind" disease of the vine, with only partial success; the disease reappeared on the treated vines but in a less degree.

Experiments on the destruction of charlock and radish have shown again the value of a 20 per cent. solution of sulphate of iron, a dressing of kainit of about 90 lbs. per acre, and a 20 per cent. solution of "cuproazotin." (1). Calcium cyanamide at the rate of 1 cwt. per acre did not come up to expectations.

"Malacidschwefel" does not fulfil its claims in the destruction of aphids. "Urania-Grün", based on aceto-arsenite of copper, produces a more permanent suspension in water than "Malacidschwefel", but is not more effective.

Prof. Lang's "Schwefelaluminiumpatronen" were not successful against hamsters and rabbits, owing to the depth of their winter burrows, but they were effective against water voles.

Immersion of seeds in creolin, carbolineum, or formalin and coal-tar is not a safe protection against the attacks of birds. Carbolineum in 5 per cent. solution is injurious to the germinating power of the seeds.

Various observations.—The results of the investigations on the introduction of phylloxera into the Grand Duchy are not conclusive; it does not appear to have been due to winged individuals coming from Upper Alsace.

Winter spores of *Plasmopara viticola* have been found in abundance on vine leaves, and the perithecia of the powdery mildew (*Uncinula necator*) were abundant on vines near houses at Durlach.

Infection experiments on *Rhytisma acerinum*, the fungus of sycamore leaf-blotch, have confirmed former experiments, which showed that infection takes place on the under side of the leaf and not on the upper surface as maintained by Tubeuf.

The organization against plant diseases in the Grand Duchy has been still further improved by the collaboration of lecturers on fruit and vine growing, and by the creation of a station for purchasing the materials required. The Central Station for the Protection of Plants organises special visits to farms where modern methods of control are demonstrated and lectures are held to stimulate the interest of farmers in the aims of phytopathology.

(1) Supplied by Ludwig Meyer, Mainz; price about 30s per 100 lbs.

- 578 - **Some Chinese Fungi** (1). — MIYAKE ICHIRO, in *The Botanical Magazine*, Vol. XXVI No. 327, pp. 37-56, plate I. Tokyo, March 1914.

A systematic catalogue of more than one hundred species and varieties collected by the writer in various localities during the summer of 1911. The majority were found on cultivated or economic plants. Of the new species new to science the following are worthy of mention: *Rehmia ulmicola*, on the leaves of *Ulmus* sp.; *Coniothyrium Tiliae*, on the leaves of *Tilia cordata*; *C. Spiraeae*, on the leaves of *Spiraea pubescens*; *Seplocium Anemones*, on the leaves of *Anemone* sp.

The following species are already known: *Gymnosporangium Ymadai* Miyake, common on leaves of *Pyrus Malus* and *P. spectabilis* near Peking; the disease often spreads so rapidly in June and July that all the foliage turns yellow, dries up and falls; *Aecidium Mori* Barcl., on the leaves of *Broussonetia Kazinoki* and *Morus alba*, widespread and injurious in Japan; *Helminthosporium Onyzae* Miyake and Hori; from observations made by the writer, this latter fungus is not so widely distributed or dangerous in China as in Japan.

- 579 - **Wintering of Cereal Rusts in the Uredo Stage**. — MONTEMARTINI, LUIGI. *Rivista di Patologia vegetale*, Year 7, No. 2, pp. 40-44. Pavia, 1914.

The writer reviews the results of other workers on the persistence of the uredospore stage during the winter months. He records the fact that at Pavia and in its Province this form of rust occurs on wild and cultivated Gramineae, which continue green after harvest, and that it reinfest the wheat plant at any time. Thus, autumn-sown wheat may be directly infected, and if the season is warm and late the disease marks its appearance. The uredo stage also appears to be able to resist several degrees of frost for many days. Further observations are required to determine the temperature which is fatal to the parasite. Under Italian conditions it seems more probable that the infection of the wheat crop takes place by means of uredospores from diseased plants during the autumn, rather than by transmission through the seed as supposed by Eriksson.

The spread of the disease is therefore influenced by the growth of grasses, the summer weather (during hot, dry summers, when grass dries up, the uredo stage gives place to the telento stage), the period of sowing and the autumn and winter weather.

- 580 - **Inoculation Experiments on Potatoes with *Fusarium*, 1913**. — HIMMEBAUR, W. in *Oesterreichisch-Ungarische Zeitschrift für Zuckerindustrie und Landwirtschaft*, Year XLIII, Part I, pp. 1-16. Vienna, 1914.

Experiments were carried out in 1913 to confirm the results obtained in 1912 on a small scale. Inoculations were made, as in 1912, of vigorous material, using mycelium only. In addition to direct insertion in the tissues of the plant, inoculations of the soil were made in the immediate neighbourhood of the plants. The experiments were begun on the 19th

(1) See also No. 754, B. June 1913.

July, and the inoculations were made on fine days between 6 and 8 a.m. in the open fields which had previously shown no sign of the disease. It was found that inoculations of the potato haulm resulted in the appearance of leaf-curl, thus proving that one form of leaf-curl in potatoes is due to infection of the haulms by the various forms of *Fusarium* (and also *Verticillium*).

- **A Leaf Disease of *Cycas revoluta*.** — MARCOLONGO, I, in *Rivista di Patologia vegetale*, Year 7, No. 1, pp. 6-8. Pavia, 1914.

For many years a number of specimens of *Cycas revoluta* in Naples have been attacked by a leaf-disease, characterised by small round yellow spots with dark edges, which extend until the whole segment of the leaf turns yellow. A slight greenish mould appears on the underside of the leaf which thickens as the disease advances. Microscopic examination has shown that this disease is due to a new species of *Cladosporium*, provisionally described as *C. Cycadis*.

In gelatine cultures nothing has been obtained but a pycnidial form, unable of reproducing itself from the stylospores. Inoculations of healthy specimens with either the conidial (*Cladosporium*) or the pycnidial (*Phoma*) forms, have produced the characteristic symptoms of the disease.

- ***Cylindrosporium Juglandis* injurious to the Leaves of Walnut in Alabama.** — WOLF, A. in *Mykologisches Centralblatt*, Vol. IV, Part 2, pp. 65-69 + figs. Jena, March 1914.

During the last two years walnut trees at Auburn, Alabama, have shown a new leaf disease characterised by numerous irregular dry spots which appear on both sides of the leaf. The spots are brown in colour with a central grey spot indicating the point of infection. Some spots are uniformly brown and others become uniformly grey owing to the entrance of air below the raised cuticle. The adjacent tissue often becomes chlorotic. A single leaf may develop from 500 to 1000 or more centres of infection, which may remain distinct or may join up so as to cover the whole leaf surface. In the summer of 1912 a small plantation was so badly affected that the trees were completely defoliated on two occasions before the normal period of leaf-fall.

The disease is caused by a *Cylindrosporium*, the fructifications of which appear on the under sides of the leaves. The fungus has been isolated in pure cultures and reproduced with success in various media, but no perithecia have been obtained in artificial cultures. Supposing that the conidial stage survives on the fallen leaves until the new leaves appear, it does not seem probable that perithecia are produced in the neighbourhood of Auburn. It is probable that the perfect form of this fungus could be produced under certain conditions, as in the case of other species of *Cylindrosporium*.

Experiments in 1913 showed that the disease could easily be kept check by destroying all fallen leaves from the diseased trees, and using a Bordeaux mixture on the appearance of the disease. The writer describes the fungus as *C. Juglandis*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

- 583 - Experiments on the Destruction of Charlock (*Sinapis arvensis*)
Mechanical and Chemical Means. — LEUTZ, J. VON in *Praktische Blätter für Pflanzenernährung und Pflanzenschutz*, Year XII, Part 3-4, pp. 43-46. Stuttgart, March-April, 1914.

The results of two years' experiments show that rolling is more effective than spraying with sulphate of iron for destroying charlock; it must be done as soon as the oats appear above ground. The rolling must be very thorough, so as to crush all the charlock seedlings, and is best repeated a second time; on stony or cloddy land this method is not applicable.

INSECT PESTS.

- 584 - Relation between the Larvae of Vine Moths (*Conchylis ambigua* and *Polychrosis botrana*) and the Weeds of Vineyards and Other Plants. — LÜSTNER, GUSTAV, in *Zeitschrift für Weinbau und Weinbehandlung*, Year Part I, pp. 3-35. Berlin, 1914.

The writer has conducted numerous experiments to determine what foods other than the flowers and fruits of the vine are available for the insects during their larval stage. He tried the larvae with 92 species of plants, the majority being vineyard weeds, others hedgerow and ornamental plants.

In the case of the *Conchylis* larvae the experiments were carried out from the beginning of September to the middle of October. The larvae were observed to be distinctly polyphagous, even devouring Euphorbiaceous plants. It will therefore be difficult to prevent the larvae from feeding on the first buds and fruits by means of disagreeable substances. They are also ready to devour the parts of the plant (e. g. the tips of shoots and young leaves, etc.) that are not generally found to be attacked.

The experiments with *Polychrosis* larvae were carried out in the spring and the larvae were found to be equally polyphagous.

These experiments show that: 1) these pests may continue to feed on the shoots of the vine, or failing this, on common weeds, so that measures for the control of the pest by the immediate consumption of the first attacked, are not adequate; 2) enclosing the bunches of grapes in burlap serves to protect the fruit, but does not decrease the danger of the spread of the insects; 3) brushing the first shoots showing signs of attack is not effective in destroying the larvae, since they find shelter elsewhere, a further this procedure is liable to cause damage to the young vine shoots.

- 585 - *Thripoctenus brui* n. sp., a Chalcid Parasite of *Frankliniella robusta* injurious to Peas in France. — VUILLET, A. in *Comptes rendus hebdomadaires des séances de la Société de Biologie*, Vol. LXXVI, No. 13, pp. 552-555, figs. 1-3. Paris, April 10, 1914.

Garden peas are sometimes seriously damaged by attacks of the pea thrips (*Frankliniella robusta*), which, in 1913, caused considerable damage.

at Montargis (Loiret). The writer describes a hymenopterous parasite of this insect, which is new to Science, under the name of *Thripoctenus*.

The description is based on numerous specimens occurring among larvae and nymphs of *F. robusta* in the flowers of peas, broad beans and sweet peas collected at Dercy (Aisne) in July 1913. *T. brui* is clearly distinguished by several characters from *T. russelli* Crawford, the only other known species of the genus, parasitic on the bean thrips (*Heliothrips fasciatus* Pergande) in the United States.

The writer received a large number of specimens of *F. robusta* from Dercy in 1913, but found no specimens of the parasite which is so abundant at Dercy during the same season. It would appear useful to distribute the flowers of peas and beans containing *T. brui* with a view to controlling the spread of *S. robusta* in the same way that Delucio (1) has controlled the olive thrips (*Phloeothrips oleae* Costa) by means of *Tetrastichus gentilei*.

6 - **Destruction of *Conchylis* Larvae by Ladybirds.** — LÖSTNER, GUSTAV in *Zeitschrift für Weinbau und Weinbehandlung*, Year 1, Part 2, pp. 65-69. Berlin, 1914.

The writer has observed that the larvae of the first generation of *Conchylis ambiguella* Hub. are devoured by the adult *Coccinella septempunctata* when aphids are lacking. They are not attacked by the larvae of *C. septempunctata* and only to a slight extent by the adult *C. decempunctata*. When protected by their silky web they are not attacked by any *Coccinella*.

7 - **The Destruction of Woolly Aphis (*Schizoneura lanigera*) and Pear Scale (*Epidiaspis betulae*) by Fumigation with Hydrocyanic Acid.** — LÖSTNER, GUSTAV in *Deutsche Obstbauzeitung*, Part 8, pp. 174-176, 1 fig. Stuttgart, April 15, 1914.

Hydrocyanic acid fumigation has long been employed in America, but was introduced into Germany by the writer. Attempts to fumigate apple and pear trees to destroy *Schizoneura lanigera* and *Epidiaspis betulae* (= *E. pyricola*) have not met with success, and the expense is so great to make the method impracticable for the treatment of fruit trees.

8 - **The Chinch Bug (*Blissus leucopterus*), injurious to Cereals in Kansas.** — HEADLEE, THOMAS J. and MC. COLLOCH, JAMES WALKER, in *Kansas State Agricultural College, Agricultural Experiment Station, Bulletin No. 191*, pp. 285-353, figs. 1-13, plates I-VII. Manhattan, Kansas, 1913.

The chinch bug existed in Kansas before the country was colonised. It hibernates on bunch grass (*Andropogon scoparius* Michx.), big bluestem (*Andropogon furcatus* Muhl.) and false red-top (*Triplasis purpurea* Walt.), from which it migrates in early spring to wheat and other cereals. The first generation reaches maturity just after harvest, and finding itself short of food, migrates to adjacent crops of maize and sorghum, where the second generation reaches maturity in the autumn. The insect then hibernates on waste grasses.

The larvae as well as the adults damage their host plants by piercing

(1) See No. 3027, B. Aug.-Sept.-Oct. 1911.

(Ed.).

the cortex, extracting the sap and destroying the tissues adjacent to the wound. The damage to crops in Kansas amounts to several millions of dollars annually, owing to the reduction in the yield of wheat and sometimes to the complete destruction of the maize and sorghum crops.

Dry seasons are particularly favourable to the development of the pest. Moist weather effectively destroys it by burying the eggs and larvae and by exposing the adults to the attacks of the fungus *Sporotrichum globuliferum* Speg., which is the only natural parasite of this insect. The fungus is widely spread throughout the regions affected by the pest, and when conditions are favourable it becomes a powerful epidemic. The most favourable conditions are a temperature of 24° C. and humidity approaching saturation.

Careful experiments have shown that it is not possible to spread the infection of the fungus by artificial means, and much money has been unnecessarily expended in adopting this method of control in Kansas. The most precise experiments have shown that destructive measures can be successfully applied twice a year, viz. during the migration of the first generation from the cereal crop to maize and sorghum, and again after hibernation. The writers have found that firing the winter quarters of the insect is the most economical and practical method of destroying

589—*Tomaspis flavilatera*, n. sp. (Hemiptera) on Sugar Cane in British Guiana (1). — URICH, F. W. in *Bulletin of Entomological Research*, Vol. V, Part I, p. figs. 1-2. London, April 1914.

The writer gives a technical description of a new froghopper, *Tomaspis flavilatera* (fam. Cercopidae), occurring on herbaceous plants and occasionally on sugar cane in British Guiana.

590—*Polychrosis botrana* and *Conchylis ambigua* in Piedmont in 1913. **Biology and Control.** — VOGLINO, P. in *Osservatorio consorziale di Fitopatologia Torino. Osservazioni sulle tignole della vite eseguite nel Piemonte nel 1913*, pp. Turin, 1914.

As the result of a conference between the Agricultural Committee of Turin and the Subalpine Vine-growers' Society, held on February 1913, a Commission was appointed to study the means of controlling the ravages of vine moths and to determine the value of tobacco extract for this purpose. The Commission met on the 1st of March and decided to appeal to local bodies and to the Ministry of Agriculture for financial help; the carrying out of the experimental work was entrusted to the Turin Phytopathological Observatory. (2).

Towards the end of April, measures were taken for the establishment of special stations for observation in various districts of the province of Turin (Moncalieri, Rivoli, Caluso), of Cuneo (Alba, Dogliani, Barolo), of Alessandria (Cassine, Mongardino) and of Novara (Briona). These

(1) See No. 352, *B.* Jan. 1911; No. 649, *B.* Feb. 1911; Nos. 1558 and 1584, *B.* May 1911; No. 1698, *B.* Dec. 1912; No. 1306, *B.* Nov. 1913, and No. 188, *B.* Feb. 1914. (Ed.).
(2) See article in *B.* July 1913, pp. 1000-1005. (Ed.).

tations were definitely established at the end of April and beginning of May. At each station one or two vines were planted in wire-netting cages, and a small meteorological observatory was erected. With a view to correlating the observations of the different stations, a special scheme of questions was drawn up, and a practical and scientific control was effected by means of special control cages of very fine wire-netting for catching the insects, at the Observatory at Turin; periodic visits were made to the various stations and important vine-growing districts. Observations were also made in districts without special stations as follows: Acqui (province of Alessandria), Gattinara (province of Novara) and the Susa valley (province of Turin).

The results obtained in 1913 show that in Piedmont *Polychrosis* is more widely distributed than *Conchylis*; the latter was occasionally numerous (50-80 per cent.) in colder districts at the mouths of the mountain valleys (province of Turin), and was also frequent (50-65 per cent.) at Gattinara. In the true vine-growing districts exposed to the sun, in the provinces of Turin, Alessandria and Cuneo, *Conchylis* was found in proportions varying from 2 to 4 per cent., exceptionally 10 per cent.: the larvae and moths found were largely *Polychrosis*.

The development of *Polychrosis* is in direct relation to the humidity of the air, being favoured by damp; abnormal changes of temperature in the spring, which have an injurious effect on the growth of the vines, have little effect on the development of the insect. The damage was caused by the spring and summer generations; the autumn generation consisted of a limited number of moths, only occurring locally, which did not produce larvae until after the vintage was mostly finished.

The spring emergence of moths occurred throughout May both in the laboratory at Turin and at the several stations; in one station only (Rivoli) they continued to appear until the beginning of June, with a maximum during the second ten days of May. They lived from 13 to 15 days and deposited their eggs on the stalks of the bunches and the pedicels of the flowers, especially in the second half of May, but also in the first week in June. The larvae of the first generation appeared towards the end of May and pupated from the second ten-days of June until July.

The summer generation of moths first appeared at the Observatory on the 26th of June, and at the Stations during the first few days of July, with a maximum emergence during the second ten days (14th to 22nd); they lived 11 to 14 days and began depositing eggs on the grapes about the 15th of July, continuing into early August. The larvae of the second generation appeared during the third ten-days of July and especially in August and began pupating at the end of August.

The autumn brood of moths only appeared in certain districts (Monardino, Dogliani, Barolo), from the 17th to the 22nd of September, shortly after the vintage. Only at Barolo was there supposed to be a third generation of larvae on the Nebiolo vine.

The season 1913 was not favourable to a biological study of *Polychrosis*, owing to the low humidity of the atmosphere, and the late spring frosts,

which in many places retarded the development of the shoots, thus depriving the moths of suitable places for depositing their eggs. Further research are necessary to complete the biological study, especially with regard to mating, oviposition, development of larvae of the second generation, resistance of the pupae to insecticides and extreme temperatures.

The mode of cultivation has considerable influence on the development and spread of the pest. Where the canes or wooden supports are replaced by iron, sandstone or reinforced concrete, the number of insects is considerably reduced.

The programme for 1914 does not require an increase in the number of stations but an extension of regular and careful observations and the use of small cages made of fine wire netting and a sheet of mica. A certain number of pupae should be introduced into the cages in the spring and summer periods. By suspending these cages along the rows, it is easy to observe the first appearance of the moths and thus to regulate the application of insecticides. Cages are preferable to lamp-traps, since *Polychroa* only flies at dusk.

Tobacco extract caused scorching in some places when used in 1 per cent. solution, but rarely in 2.5 per cent. solution, though combined with Bordeaux mixture; a concentration of 2 to 2.5 per cent. was found to be most appropriate. It was not always effective in keeping the moths away from the vines, and in some places was hardly satisfactory for destroying the larvae, though in others two applications during the period indicated by the flight of the adults were completely effective. The addition of sodium carbonate (1 lb. in 100 gallons) to the tobacco extract (without Bordeaux mixture) increased its efficiency; an intermittent application should be used.

Tobacco dust damaged the vines in only two places, but was entirely without effect against the larvae.

Lead arsenate in 1 per cent. solution gave good results, combined with Bordeaux mixture, or used for dipping the young bunches.

The best results are obtained by employing arsenate of lead to destroy the first generation larvae, at least until tobacco extract can be obtained with a guaranteed nicotine content so as to avoid danger of damaging the young shoots. During July and August it is preferable to use tobacco extract (2 to 2.5 per cent.), since it acts as an insectifuge and avoids the difficulties of arsenate. The treatment should not continue later than the first few days of August, owing to the danger of affecting the flavor of the wine. In spraying, care should be taken to cover the neighbouring shoots with the liquid, since the moths kept away from the bunches would otherwise deposit their eggs on the leaves, and the larvae might reach the bunches.

In 1914 attention should be paid to clearing the vine stocks and removing hiding-places suitable for the hibernation of the pupae. On small holdings it would be useful to resort to hand picking of the larvae, without neglecting the use of insecticides.

Distribution of their natural enemies should be promoted by during the winter badly attacked grapes in tubs covered with tiling. Further, many pupae may be trapped by placing dark or bunches of straw among the old wood of the vines.

- *Agromyza pruinosa* (Diptera) on River Birch (*Betula nigra*) in America. — GREENE, CHARLES T. in *Journal of Agricultural Research*, Vol. I, No. 6, pp. 471-474, plates LX-LXI. Washington, D.C., 1914.

The writer describes the different stages of development of *Agromyza pruinosa* Coq., the larva of which, unlike those of other species of *Agromyzidae*, bores into wood; this species produces borings, known as "pith ray flecks", in the cambium of the river birch (*Betula nigra*).

During July and part of August 1912 considerable damage was caused by this insect at Chain Bridge in the District of Columbia, whilst in 1913 it was only recorded on a few trees in this locality. The attacked trees appear quite healthy externally, the borings in the cambium being only visible on raising the bark.

The writer reared six adults of *A. pruinosa* during the spring of 1913 and found that it resembled very closely *A. carbonaria* Zett. which causes considerable damage to birches in Europe. He records *Symphya agromyzae* Rohwer, as parasitic on the eggs of *A. pruinosa*.

